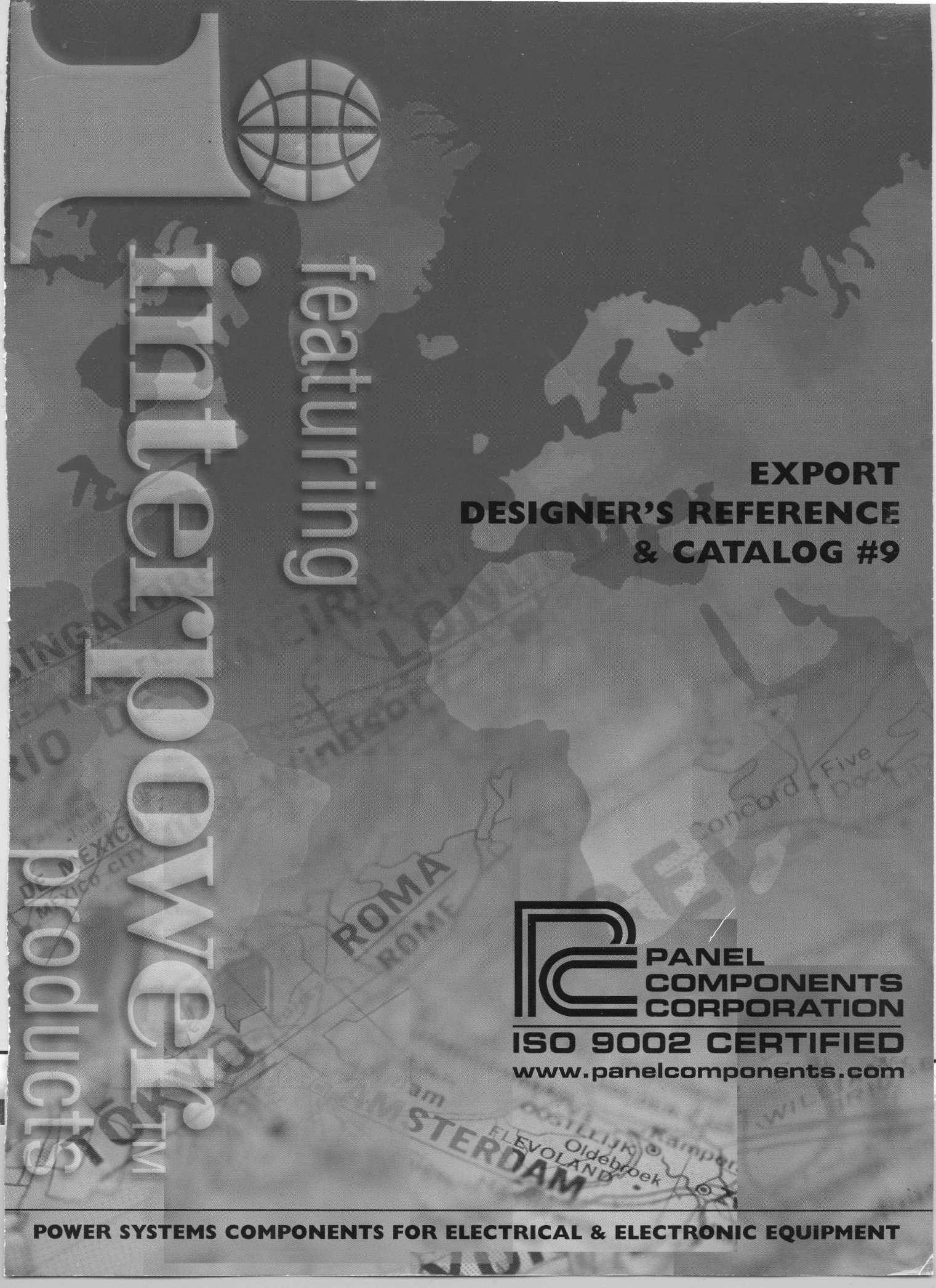


EXPORT DESIGNER'S REFERENCE & CATALOG #9

PANEL COMPONENTS CORPORATION

ISO 9002 CERTIFIED

www.panelcomponents.com

POWER SYSTEMS COMPONENTS FOR ELECTRICAL & ELECTRONIC EQUIPMENT

Panel Components Corporation

Panel Components Corporation imports and manufactures power components such as international cords, cordage, plugs and sockets, which are used by North American manufacturers who wish to market their products both domestically and overseas. These products are sourced or manufactured to comply with the standards and requirements of international safety testing agencies such as UL, CSA, VDE, SEMKO, etc. Panel Components' products are indicated by the **Interpower**™ trademark.

Oskaloosa, Iowa

Customer Service Departments

Panel Component's Customer Service Departments in Oskaloosa, Iowa and Ames, Iowa are ready to assist you with price and delivery quotations, stock checks, samples, technical assistance, and order entry.

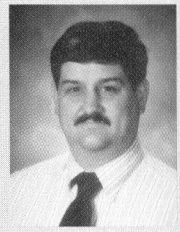
Call & FAX Toll Free
U.S., PR, VI & Canada)
Monday – Friday,
7 A.M. – 7 P.M.
(Central Time)

Call: (800) 662-2290
FAX: (800) 645-5360

Tammy Finch

Jane Lewachowicz

Wendy Meyer



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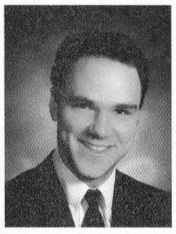
Judy Nunnikhoven

Virginia Pierson

Shannon Reed

Heather Steinlicht

Kathy Whitehead



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Customer Service Supervisor

JoAnn Keferl,
Customer Service Supervisor

Kay Rhine,
Receptionist

Kathy Grubb,
Receptionist

Chris Anderson,
Clerk

Nellie Bair,
Credits and New Accounts Specialist

Ordering Information

Place orders with our Customer Service Department in Oskaloosa, IA, by telephone (toll-free), FAX, or mail. You may also place orders through our sales representative for your area. Although most customers establish an open account with us, we also accept MasterCard and Visa.

Orders are shipped from our substantial inventory which is centralized in Oskaloosa. We do not have distributors. Orders for items in stock are normally shipped within 24-48 hours, but we are prepared for same-day shipments if the order is placed by 3P.M. Central Time. We will prepare customs documentation for Canadian customers at no extra charge. For more information on our ordering policies and procedures, see page 270.

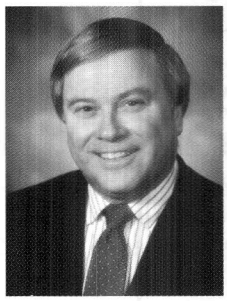
In a hurry for your order?

- We are prepared for same-day shipments if parts are in stock and your order is placed by 3 p.m. Central Time.
- Ask us about special rates on Federal Express shipments.
- For your convenience, we accept MasterCard and Visa.

Sales Representatives

Panel Components Corporation's sales representatives are located in 46 offices throughout the United States and Canada. Contact the sales representative covering your area if you require local technical assistance. Our sales representatives and their contact numbers are listed on the inside of the back cover.

From the president...



Hello!

Designing an electrical or electronic product for sale globally has always been challenging, but at least three trends make this task considerably more difficult today for North American manufacturers than it has been in the past:

1. An engineering manpower shortage severely impacts smaller manufacturers and makes it difficult for them to devote the resources necessary to address the intricacies of both North American and foreign regulations and power input requirements. The fact that these requirements change continually adds to the challenge of designing for global markets.

2. Shorter product life cycles add to the engineering challenge because products must be redesigned more often.

3. And, time-to-market pressures force successful manufacturers to incorporate new ideas into products faster than ever before.

These trends boil down to getting more done, more quickly and efficiently than in the past.

At Panel Components Corporation, we are committed to helping you design competitive global products quickly and efficiently.

- We offer one stop shopping with a very broad range of power systems components that will assist you in quickly and easily addressing global power requirements.
- Our Interpower™ products, many of which we now manufacture ourselves, carry agency approvals that are essential on equipment that will be sold globally.
- Our customer service team is ready to assist you with technical, price, and delivery questions, and they are equipped to answer most of your questions quickly so that you can get on to more important work.
- We maintain a large inventory at our headquarters in Oskaloosa, Iowa, in a public warehouse in Mississauga, Ontario, and at our European subsidiary in Bognor Regis, United Kingdom. We are prepared to ship most orders the same day we receive them.
- A real person will answer our telephones (no automated call attendants at Panel Components Corporation) during our working hours from 7:00 A.M. to 7:00 P.M. Central Time (8:00 A.M. Eastern Time to 5:00 P.M. Pacific Time).
- We have a "no-minimum order" policy which will be particularly valuable to our smaller customers who need to launch products quickly.

We look forward to helping you compete in the global marketplace.

Sincerely yours,

Robert D. Wersen,
President

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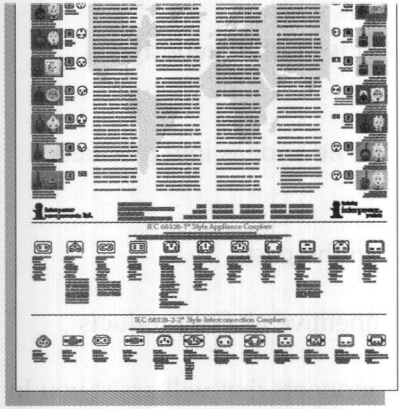
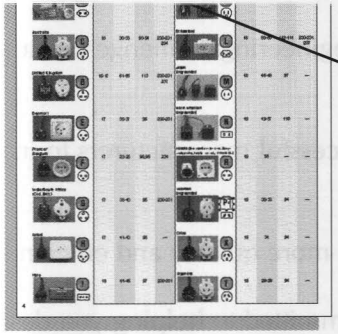
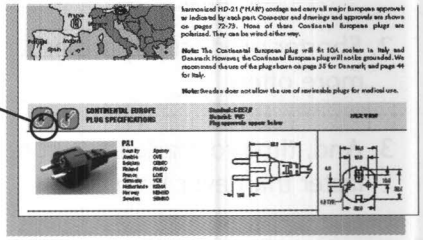
This catalog is printed on recycled paper

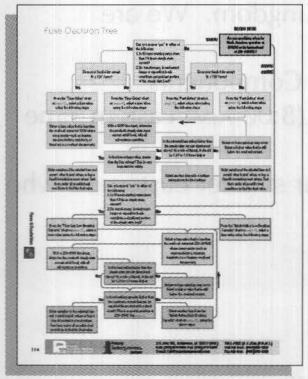






If you are designing a new product...

you need various primary power components with adequate ratings for your application. The decision trees and component selection charts throughout this catalog will help you focus quickly on those parts that meet your rating needs. Use this method to design your product for the global market while minimizing the number of changes required to sell to various national markets.



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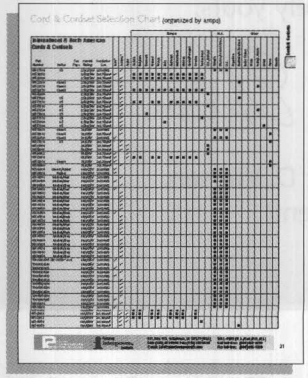

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Know the part number?

See the index on page 271 to find out what page it is on.

Need ordering information?

See ordering policies on page 270 or call our Customer Service Department toll free.

What are Interpower™ products?

Interpower™ is Panel Components Corporation's trademark. Interpower™ products meet high standards of quality and comply with applicable international and North American safety standards. Specify Interpower products for the best value.

Guide to Symbols used in this catalog

NEW! New product.

Products designed for medical applications.

See the Designer's Reference Section (beginning page 243) for more information.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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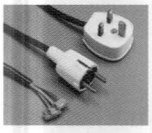

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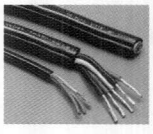

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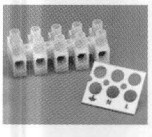
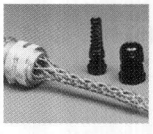

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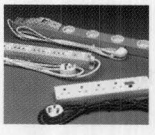

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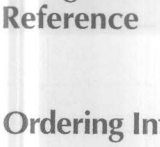
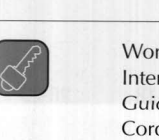

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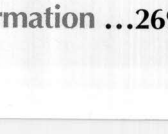

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Quick Source—International Power Connections

See fold-out poster for a country-by-country listing of World Plug Patterns, with a guide to operating voltages and frequencies.

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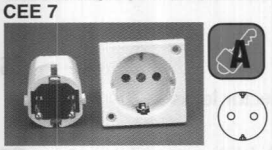
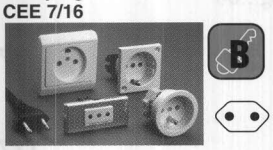
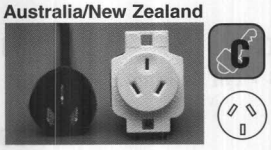
Cont. Europe (Schuko) CEE 7 	15-16	23-26	90-92	230-231 232-233
Europlug CEE 7/16 	16	27	92-93	230-231
Australia/New Zealand 	16	30-33	93-94	230-231 234
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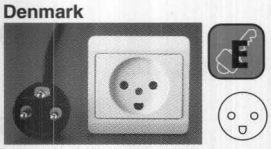
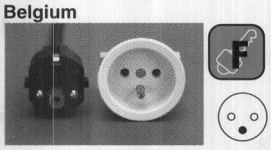
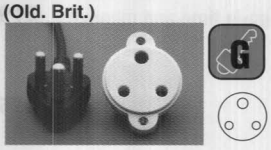
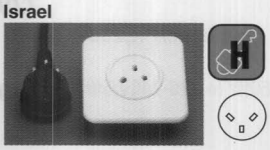
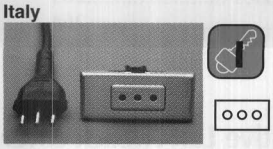
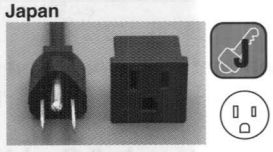
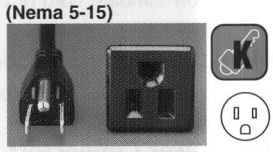
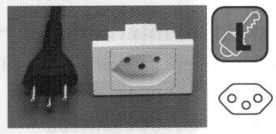
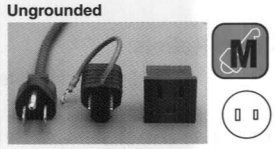
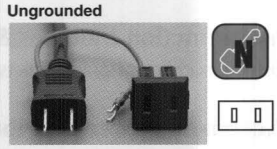
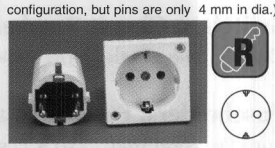
Denmark 	17	35-37	95	230-231
France/ Belgium 	17	23-26	90,95	234
India/South Africa (Old. Brit.) 	17	38-40	96	230-231
Israel 	17	41-43	96	—
Italy 	18	44-45	97	230-231

See pages below ▸	Description of standard	Cords & Cordsets	Plugs & Sockets	Socket Strips
Japan 	18	46-48	97	—
North America (Nema 5-15) 	18	49-57	98-110	235-236
Switzerland 	18	59-60	112	230-231 237
Japan Ungrounded 	18	46-48	97	—
North American Ungrounded 	19	49-57	110	—
Russia (Note: Similar to the Cont. Europe configuration, but pins are only 4 mm in dia.) 	19	58	—	—
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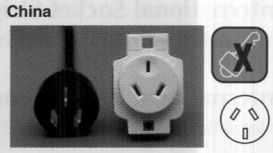
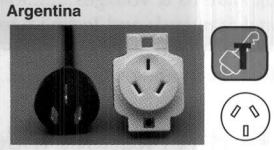
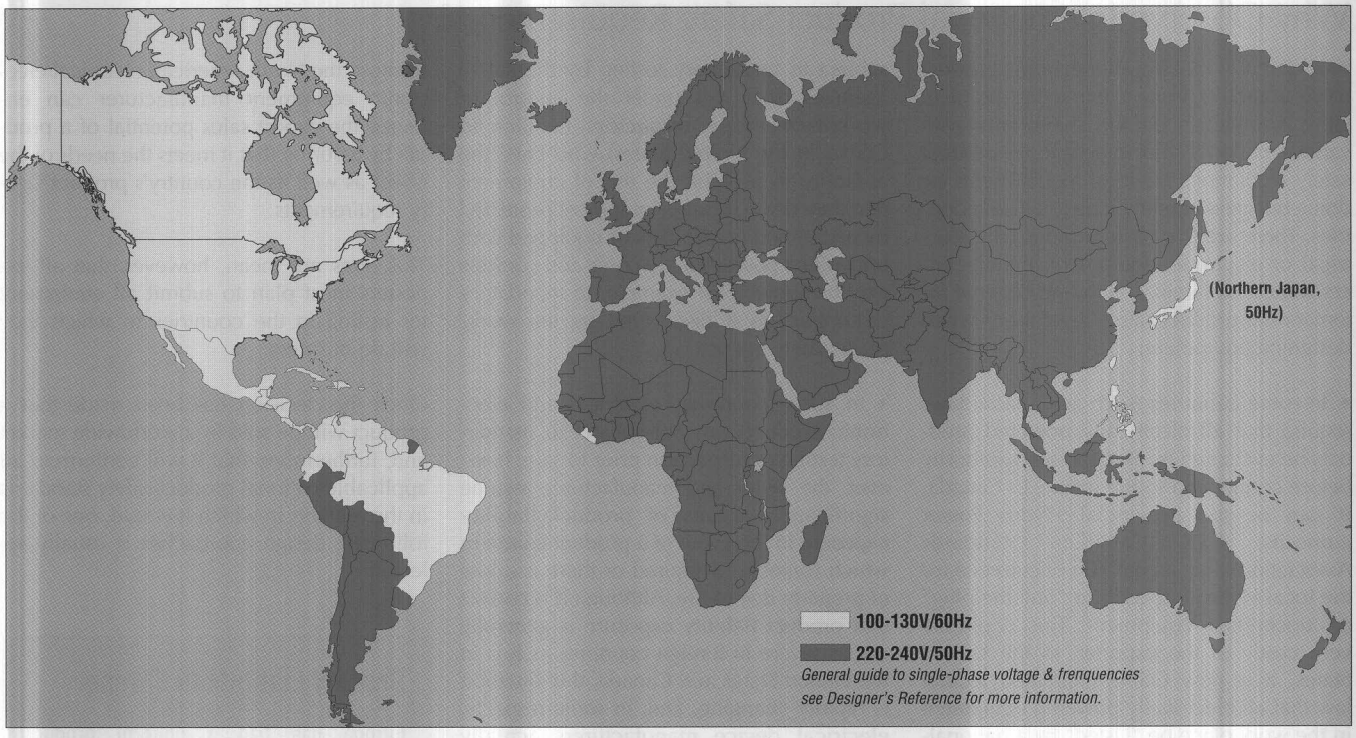
China 	18	34	—	—
Argentina 	18	28-29	—	—



The Global Marketplace

Markets for electrical and electronic equipment are truly global and, because of this, more competitive than ever before. It is no longer sufficient to consider just those competitors in Los Angeles, Chicago, and Toronto. One must also be ready for competitors from Taipei, Osaka, Munich and London.

Overseas manufacturers know that in order to prosper—and in some cases to survive—they must participate in U.S. and Canadian markets for their products. Conversely, many U.S. and Canadian companies are responding to our new, highly competitive markets by exporting vigorously, taking the battle for markets directly to foreign competitors' doorsteps.

Because of the growth of a global market for electrical and electronic equipment, more U.S. and Canadian manufacturers of these products are exporting now and in greater volumes than ever before. Even startup organizations who have yet to make their first shipment have market plans that include exports.

And where do they export? Most exports of electronic equipment go from North American to Europe, Australia, and industrialized countries in East Asia. Some electronic equipment is also exported to developing markets in Latin America, the Middle East and Asia. Electrical equipment, on the other hand, is generally sold throughout the world, in industrialized as well as developing markets.

The big growth markets for North American exports in the 1990s appear to be the fifteen EU (European Union) and the EFTA countries in Europe*, certain Far Eastern countries, and some of the Eastern European countries. Growth in exports to Europe will probably be most important to electronic equipment manufacturers. The fall in inter-European trade barriers has helped European economies become significantly more efficient and this will translate into increases in the rate of economic growth, a growth in standards of living, and increases in consumer demand, particularly for imported products.

Export opportunities to the Far East will probably be limited for some time as these countries adjust political structures to allow market economies to develop.

Finally, some of the Eastern European economies are offering some export potential for high tech products which can now be exported to former East bloc markets.

In the past, many North American exporters were able to simply ship a high technology product manufactured for U.S. or Canadian markets to a customer who was frequently willing to buy it "as is" at almost any price. He was then faced with the necessity of trying to understand instructions written in a foreign language, installing the appropriate power cord (or plug), making internal adjustments to accommodate the local power supply characteristics, and then replacing or at least adjusting the circuit protection system to the resulting current levels.

In order to be successful now, it is essential to offer products that are flexible enough to be adapted easily to the needs of local markets, without requiring reconstruction by the user. This is especially important with regard to power cords, circuit protection and electromagnetic compatibility requirements and is, in fact, exactly what any successful domestic marketer would do to assure the success of its products at home. Clearly, the same rules apply now in export markets.

In effect, the world has become a more cohesive market, in a global economy. When we talk about "international" anymore, we mean a world that includes our own domestic market, not just the countries to which we export.

** EU countries include France, Germany, U.K., Ireland, Belgium, Netherlands, Luxembourg, Denmark, Italy, Spain, Portugal, Sweden, Austria, Finland, and Greece.*

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authority, CSA (Canadian Standards Association). It is a common occurrence for the local Hydro Inspector to "pull the plug" on uncertified equipment. This could be very costly to the exporter. In the United States, it is now OSHA-mandated federal law that all electrically powered equipment in the work place be "Listed" by a nationally recognized test laboratory ("NRLT").

- Some kinds of equipment (primarily devices intended for use in the home) cannot be sold in Sweden or Switzerland, for example, without being tested and approved by SEMKO and SEV respectively. This restriction applies in varying degrees to other markets as well.

- Other kinds of equipment, although not exposure in the event of a product failure in which someone is injured or there is a loss of property due to fire. Although it is correct that product liability exposure is generally not as severe in foreign countries as it is in the United States and Canada, this situation is rapidly changing, and, in some respects, electrical device manufacturers actually have greater exposure in some foreign markets than they do in North America (see inset at left).

- Other very good reasons for compliance to international regulations include: enhanced quality and reliability of the product, meeting your competition head on and, lastly, peace of mind in knowing that you sell a product that is not only safe but one that conforms to international expectations for safety.

Conforming to Local Safety Requirements

There are three levels of conformity to local safety standards:

Safety agency approvals: Products are submitted to the national agency for testing and approval

In general, this option is taken by manufacturers of home appliances and other devices subject to mandatory testing and approval. Other manufacturers may choose to travel the agency approval route because it is advantageous for competitive reasons or because they sell to government agencies who specify approvals as part of the specifications in their requests for proposals. They may also choose to gain national agency approvals as part of a strategy to minimize their product liability exposure.

Conformance but no approvals: Products are designed to conform to all agency requirements but are not submitted for testing (except for RFI testing which is mandatory for most electrical devices in Europe).

This option is now the lowest level of conformity that is permitted in the EU. Provided that detailed rules have been followed, electrical and electronic equipment can be self-certified and carry the CE Mark. The CE Mark simply allows importation of the equipment into the EU.

The rules that control the application of the CE Mark to equipment will require the designation of an European Union based individual or business who will take responsibility for product liability claims and findings by national test agencies that products in the market do not satisfy European safety standards.

This option is taken by manufacturers of products that are not currently subject to mandatory testing but who want to actively sell products in the EU and want to be ready if agency testing and approval becomes desirable.

following design approaches is usually selected.

Product Liability in Europe

Europe has had a uniform product liability law since 1988.

The legislation provides for strict liability on the part of manufacturers and their European distributors: if someone is injured or killed while using a product, the manufacturer or distributor is presumed to be guilty of making or selling a defective product. User negligence is no longer a defense; a trial is used only to determine the extent of the manufacturer's liability.

"User friendly" only: Products are designed to be user friendly in that the appropriate power plug is installed and the unit is designed and built to operate at local power mains voltages and frequencies.

This is the lowest level of conformity to international standards which offers any competitive advantage and it applies only in a rapidly diminishing number of developing countries. However, in today's very competitive markets, it is very difficult to imagine successfully selling any product that cannot be simply unpacked, plugged in and turned on. The days of shipping products that the purchaser has to rebuild prior to use are gone. (Remember that in some countries, all electrical and electronic products must be tested for conformity to RFI regulations prior to sale. Failure to do so is a violation of the law.)

Designing for compliance with international product safety requirements begins with an understanding of where the standards originate

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Conforming to Local Safety Requirements, cont.

and who certifies that your product meets a standard.

The development of unified market in the EU has resulted in the elimination of most national deviations to European standards. Not everything is uniform throughout the EU however. National power plug standards have been unchanged since the 1960's and they still result in five different class I grounded plugs in common European use. Nonetheless, the overall trend has been towards uniform electrical standards in Europe and even the acceptance of test results between national agencies in some cases. It has become easier to design one product that satisfies all of the European test authorities.

The result in these developments is that more equipment is now produced and then tested by national test agencies than was the case a decade ago. Customers now expect that most products will carry an appropriate agency test mark. Testing and approval marks are less and less an option for equipment manufacturers who want to sell their products in Europe.

What Standards Must Electronic or Electrical Equipment Meet?

As a prerequisite for determining what standards to meet, it is essential to know what markets you are going to sell in. Standards for product safety are generally prescribed by each country's own national test or standards writing agency. In Europe, CENELEC standards are now official for many types of equipment and they apply throughout the European Union and several neighboring countries.

However, economic reality has mandated that individual countries wishing to participate in world trade make their standards as close as possible to IEC standards. Consequently, the uniqueness of local standards is going away. This is the case with CENELEC standards which are very similar to equivalent IEC standards.

Currently, one of the most important international standards to the electronics industry is **IEC 60950*, "Information Technology Equipment."** This standard addresses computers, business and office equipment and is the basis for other documents adopted by various agencies and countries. The following is a small subset of standards that emulate IEC 60950*:

EN 60 950	European Normalization document Issued by CENELEC for use in Europe
AS 3260	Issued by SAA for use in Australia
UL 1950	Issued by UL for use in the United States
C22.2, No. 950	Issued by CSA for use in Canada

Therefore, the standards that will afford your product with the greatest degree of acceptance are based on those written by international standards writing organizations. Unfortunately, many countries are finding it difficult to jump right in and embrace, completely, international standards. This is usually due to the presence of a strong local national electric code. The result is that some standards purporting to be IEC emulating are not 100% compliant. The more deviations there are, the less likely compliance to that standard would be accepted on a global basis.

See pages 256-261 for a listing of international standards documents.

European & International Standards Writing Agencies

The four most important overseas standards writing agencies are:

- **International Electrotechnical Commission (IEC)**
- **European Committee for Electrotechnical Standardization (CENELEC)**
- **European Committee for Standardization (CEN)**
- **International Organization for Standardization (ISO)**

In general, IEC and CENELEC develop standards for products powered by electricity, whereas CEN and ISO are active in areas other than electronic concerns.

The **IEC** is headquartered in Geneva, Switzerland, and consists of representatives from most of the world's industrialized nations. Recommendations for standards are written by working groups which consist of experts in specific technical areas. These technical experts are drawn from manufacturers, users, and the national testing labs. Although IEC publications take the form of recommendations and are not standards with the force of law, they are the basis for most national standards. In fact, most new standards published by European and Australian agencies have only minor deviations from IEC publications. Although the U.S. and Canada are IEC members, in general the standards that deviate most from IEC publications are those developed by UL and CSA.

The **IECEE** is also located in Geneva, at the offices of the IEC. (IECEE used to be called CEE, but was made part of the IEC in 1985. The CEE, which was composed of representatives from the European national standards agencies, was the main regional standards writing agency in Europe.) IECEE's function, like the organization it replaced, is to administer the "CB Scheme" through the CCB committee of the IEC.

The **CB Scheme** is a plan where each member country's national test lab agrees to accept the test data of other member country's test lab for the purpose of assuring reciprocal recognition of test marks by European test agencies. CEE standards are no longer issued. Those that were issued prior to 1985 were supposed to be superseded with IEC standards by now. However, progress is slow and today the list of IECEE standards is made up of old CEE and newer IEC standards. A list of standards used by the IECEE can be found in the "Guide to International Standards Publications" in the Designer's Reference section, pages 256-262.

CEN/CENELEC is an agency charged with responsibility for developing standards which represent a consensus among its European member countries. Although IEC publications usually form the basis for most European national standards, CEN/CENELEC will develop standards called European Norms ("EN" documents) or harmonizing directives ("HD" documents) to cover matters which its members feel are not adequately addressed in IEC documents. CEN/CENELEC documents HD-21 and 22 are prominent examples; these documents define European standards for PVC and rubber jacketed power cable.

ISO, a sister organization to IEC, concentrates on writing non-electrical standards. An important document of concern to North American manufacturers is **ISO 9000** which outlines manufacturing quality systems—see inset, page 9.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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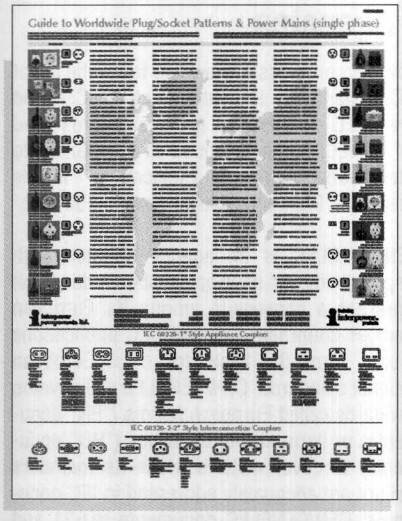
Major International Testing Agencies

Germany	VDE	
Austria	OVE	
Belgium	CEBEC	
Canada	CSA	
Denmark	DEMKO	
Finland	FIMKO	
France	LCIE	
Netherlands	KEMA	
Norway	NEMKO	
Sweden	SEMKO	
Switzerland	SEV	
United States	UL	

See pages 244-255 for a listing of standards and testing agencies and their addresses



Specify Panel Components Corporation's products with confidence

Panel Components Corporation's product philosophy is oriented towards making compliance easy for the equipment designer. Wherever possible, products marketed by Panel Components Corporation, especially those with the Interpower™ trademark, have been designed or selected so that one single component can be used in as many different countries as possible.

Who Enforces International Safety Standards?

It is important to recognize that publication of standards, along with enforcement and testing to these standards, is undertaken at the national level.

International documents are good guides for equipment designers but the final interpretations, and issuing the license that attests to the fact that you do meet the standard, always rests with the national test agencies. **VDE** (Germany), **SEMKO** (Sweden), **NEMKO** (Norway), **FIMKO** (Finland), **KEMA** (The Netherlands), **CEBEC** (Belgium), and **SEV** (Switzerland) are some of the European agencies which write their own standards and which perform tests to these standards. (See pages 244-255 of the Designer's Reference section for a listing of agencies.)

In most cases the national standard will simply be a translation into the local language of the applicable IEC or CENELEC document with any national deviations noted in English at the front of the publication.

Each agency maintains a list of equipment which is subject to compulsory testing. This list varies somewhat from country to country but usually consists of kitchen appliances, home entertainment electronics equipment, and other devices used in the home. Equipment which falls into these categories usually must be tested and approved as safe before it can be marketed in the country.

Why Use Approved Primary Power Components?

Although it may be possible to get an entire piece of equipment approved by test agencies without using approved components, it will be easier, faster, and much less expensive when primary power components with agency approvals are used. There are four basic reasons for this:

1. **Many agencies reserve the right to test unapproved primary power components** separately, causing delays and creating extra charges for testing.

2. **Extra component testing, particularly if not foreseen at the time of equipment submittal, causes additional communications and delays** while additional component samples required for testing are provided. Furthermore, it generally knocks the equipment out of the test sequence until the required components arrive and are tested successfully.

3. Even if the unapproved components are accepted by the agency, they are given an **"applications approval"** which **allows their use only in that specific application**. This applications approval is not binding on the agency when the next product is submitted, and therefore it is conceivable that a specific unapproved component will only be used on one model in lower quantities than might otherwise be realized. This can result in higher components cost than if a single component could be used in several projects.

4. An applications tested component (an unlicensed component) will be documented in the test report of your product, and **you will become responsible to the agency for the construction of a part that you may have no control over.** It's possible that the component manufacturer will change something on the part without your knowing about it and that will cause you to fail your factory inspection. You probably can get the problem sorted out, explained to the agency or corrected in time, but while that is happening your factory may be shut down.

The use of unapproved components is therefore economically viable only in those cases in which production levels are very high, and where accurate component specifications and contractual vendor control is attained.

With the exception of a small number of manufacturers of personal computers and related peripherals, home entertainment electronics equipment, and appliances, few producers of electronics equipment can justify economically the use of unapproved primary power components.

Please note that some test agencies do not require tests on primary power components before the piece of equipment is approved. Some agencies will accept testing performed by others. Still other agencies do not require that any of the primary power components be previously tested; they simply test all of them in the circuit in which they are intended to be used.

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International Safety Compliance is a Corporate-wide Undertaking

Regardless of which design approach is selected for the product being exported, a successful international agency compliance effort must be regarded as a corporate-wide effort. Although it may begin with engineering, it must involve production, quality, purchasing, legal, insurance, and marketing function influences in order to be effective. Because it is essential that all of these groups and influences work cooperatively towards the same goals, active support by top management is extremely important. This support should come in the form of a clear corporate policy statement that defines the corporate responsibility to provide products which comply with national and international regulations. It should also define which agency requirements (such as VDE) and which standards (such as IEC) should be satisfied.

A quality system certified to ISO 9000 is an essential element of of the certification process at some European agencies. They take the position that they will test a product at the beginning of its life cycle and they may test periodically by purchasing samples in the marketplace, but a quality system that assures that the same product is going to be produced continually is an essential part of the process.

Implementing a Corporate Safety Policy

A strategy that implements the corporate safety policy commitment should include the following:

- Identification of a person who has overall responsibility for corporate compliance with international product safety regulations.
- Definition of responsibilities of all departments and groups involved in the compliance effort.
- Determination of specific regulations or standards which must be met as well as a listing of required agency approvals which will apply to the corporation's products.

The international regulations issue should be incorporated in the product design or engineering effort right from the beginning. This will reduce the amount of effort and cost that will otherwise be wasted in changes and corrective actions that might be required.

Your designated Compliance Engineer should play an active role in the product's development, preferably beginning with the investigation stage, in order to

ISO 9000—European Community Directives May Mandate a Certified Quality System For Manufacturers of Products Sold in Europe

What is ISO 9000?

ISO 9000 is a series of standards for the management of quality systems in almost any type of organization. Manufacturers, distributors, service agencies, or even design firms can achieve ISO 9000 certification which more and more customers agencies are beginning to require of their suppliers. In addition, some European directives and agencies require that manufacturers maintain a certified ISO 9000 system. This to ensures that safety requirements are adhered to through the design, production, and distribution phases of the product.

There are three main standards in the ISO 9000 series:

ISO 9001 - Contains 20 requirements for organizations involved with design, development, production, installation, and servicing.

ISO 9002- Contains 19 requirements for organizations involved with production, installation, and servicing.

ISO 9003- Contains 16 requirements for organizations involved with final inspection and test.

The key requirements of ISO 9001, 9002, and 9003 include the following:

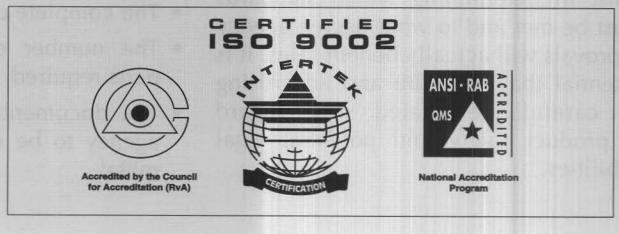
- A documented quality system (i.e. quality manual and procedures),
- An internal audit system to verify compliance with the documented quality system, and
- A corrective and preventive action system to ensure compliance is maintained.

The ISO 9000 standards are published by the International Standards Organization (ISO) located in Geneva Switzerland. Normally the standards are adopted by countries like the U.S. and given a new name (e.g. ANSI/ASQ Q9000-1994 for the U.S.)

By now, most manufacturers are familiar with the ISO 9000 standards. This series of standards was first introduced in 1987 and was revised in 1994. Also in 1994, Chrysler, Ford and General Motors introduced QS 9000. This new quality system model uses ISO 9000 as the framework but it places emphasis on the additional requirements of the automotive industry.

Panel Components Corporation is ISO 9002 certified

Panel Components Corporation was certified by Intertek May of 1995. Intertek audits every 9 months. Panel Components Corporation internally audits year round.



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cause of special regulations on documentation that exist in many European countries. Ideally, the product's documentation should be developed simultaneously with the product and should be subject to regular review by the Compliance Engineer. It is important, and sometimes mandatory, to provide safety instructions in the language of the country the product is sold in.

Calibrated test equipment necessary to duplicate and anticipate tests by the various international test agencies should be available during the product design process. Prototypes and subassemblies can then be tested in order to verify compliance with international safety standards. Calibration to the appropriate national bureau of standards is mandatory at all safety agencies.

Test equipment should include a 50Hz power source capable of providing power with voltages ranging from 95 to 255VAC. Since 50Hz testing is usually the most severe, it is mandatory for any product being rated for service at 50Hz.

Marketing and sales personnel can provide valuable feedback concerning the regulatory climate of each target marketplace. When the marketing staff is actively involved in the process, it can provide information about requirements and preferences and the differences between them. Marketing can generally assist in determining which standards must be met and to what degree agency approvals will actually benefit sales. It is essential that literature and advertising be carefully evaluated with regard to product safety and potential legal liabilities.

ucts after they have been released to manufacturing to assure continued compliance with safety regulations is important. Furthermore, the establishment of a product-recall system which allows the manufacturer to locate products that have already been sold to clients may be required by some regulatory agencies or Certified Quality Systems and may also reduce insurance rates.

A library of international safety and test standards is a must. This library should include applicable IEC publications as well as specific national standards applicable to each of the target markets. (See pages 256-262 in the Designer's Reference section of this catalog for a list of some recommended documents).

Working with Safety Agencies

The first step should be to identify the appropriate agencies in each of your target markets. The list of agencies, their test marks, and addresses, on pages 244-255 in the Designer's Reference section of this catalog may be of some assistance.

Contact each of the agencies early in the design process of the product to obtain the following:

- Copies of applicable agency standards
- Procedures and forms required for submittal
- The complete cost for the test project
- The number of samples and spare parts required
- The documentation expected by the agency to be supplied with the submittal
- Designation of the party responsible for the investigation (this could be an agent or party other than the manufacturer)
- Designation of the party responsible for payment
- Sufficient samples of the product under investigation
- Spare parts and subassemblies (usually needed for fault testing, special test, repairs, or for constructional review)
- Preliminary deposit or evaluation fee
- The location of all facilities that will manufacture the product
- Unpotted transformer (for verification of construction)
- All product manuals: operating, maintenance, repair and installation instructions
- Any additional equipment needed to operate the product
- Description (manufacturer, part number, electrical rating) of all critical components, including agency approvals. In some cases the actual license issued by the agency, to the manufacturer of the part.
- Completion of any information request forms provided by the agency
- All electrical ratings of the product
- Description of insulation systems (e.g. transformer); describe insulation material, thickness, layers, configurations, etc.
- Product description and dimensions

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What is the CE Mark?

In its simplest form, the CE Mark is an electrical device's passport that allows it to enter Europe. It symbolizes that the equipment complies with all requirements relating to safety, public health, consumer protection or other requirements defined in directives issued by the Council of the European Union. It is neither an agency approval nor a quality mark. It does nothing more than let the responsible customs official know at a glance that the equipment is authorized to enter and to circulate freely within the EU (European Union).

figure 1. CE Mark

may be subject to civil and criminal penalties.

What equipment must carry the CE Mark?

Electrical equipment, medical devices, telecommunications terminal equipment, weighing instruments, machinery, construction products are some of the devices that must carry a CE Mark. More information on European Union directives and Council legislation concerning the use of the CE Mark is available from the European Union. Their website address is www.eurunion.org. Their U.S. office can be contacted as follows:

European Union, Delegation of the European Commission to the United States
2300 M Street NW
Washington, D.C. 20037
Telephone 202/862-9500
FAX 202/429-1766

complies with all applicable European Union directives.

When is the requirement for the CE Mark effective?

Although there are some exceptions, most equipment was subject to the CE Marking rules beginning in the early 1990's with transition periods that have already ended.

How does the manufacturer get the CE mark?

What can the manufacturer do to make acquisition of the CE mark easy? As with most regulatory compliance matters, large organizations have more options concerning acquisition of the CE Mark. The comments that follow are therefore directed specifically at smaller organiztions that are not set up to economically self-certify their products.

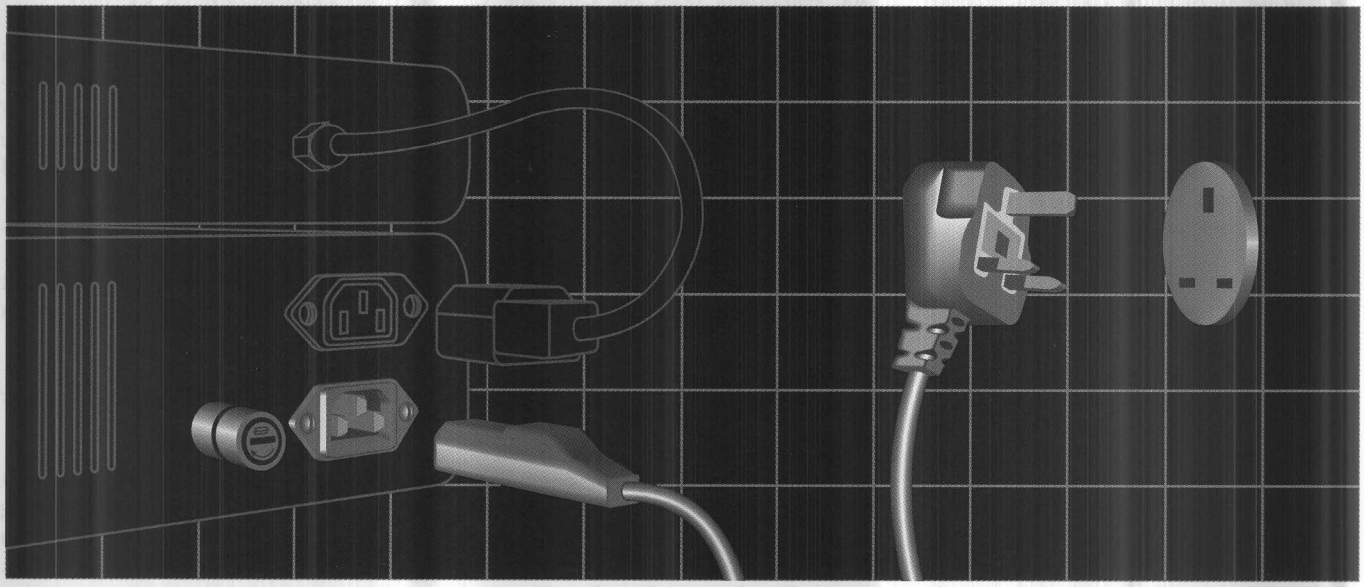
Conclusion

Preparing and submitting products for testing by international product safety agencies is complex and time consuming. It is, however, an essential part of any successful business venture. Proper organization and preparation can make international product safety compliance attainable within realistic cost and time parameters.

Smaller companies may choose to utilize the services of a consultant who is experienced in handling agency submittals. If you expect to develop several products over time, the consultant could be retained to help develop the capability internally to handle agency submittals. Realistically, unless the you are prepared to dedicate substantial resources to the international compliance effort, the learning process should be expected to take three to four submittals. After that, a dial-up arrangement with a consultant for quick questions would probably prove useful.

Although Panel Components Corporation does not provide in-depth consulting services, we will try to answer telephone questions about components. We offer this service free of charge. We also maintain a list of consultants who have notified us that they are interested in work in the product safety area and we are willing to pass this along on request as a service to our customers. Please note that we make no judgments about the firms on our consultants list, and the exporter should expect to take all necessary steps to qualify the consultant themselves.

Power Entry Design for a "Universal" Product



Europe will complete shift to 230VAC electrical distribution voltage in 2003

A 230VAC nominal voltage for public low-voltage electrical distribution systems will become standard in all of Europe except for the United Kingdom in 2003. This will complete an adjustment process that began in 1995.

Single phase circuits will be standardized at 230VAC and the voltage between outer conductors of three phase circuits will be 400VAC. The acceptable voltage tolerance by 2003 will be ±10%.

CENELEC Memorandum No. 14 requires that appliances must be marked with the new voltages. This requirement has been in place since 1993.

The operative document is HD472 S1 which was prepared on the basis of IEC Publication 38 (6th edition).

What do we mean by a "Universal Product"? A "Universal Product" is one designed from the beginning to satisfy North American **and** international product safety requirements; a product that can be easily adapted to meet the different power entry requirements of international markets.

There are several important differences between North American and European and International standards that affect the power entry design of a Universal Product.

Voltages and Frequencies: International single-phase power mains are generally grouped as follows:

100-120V/60Hz: North America, Venezuela, Colombia, Ecuador, Northern Caribbean Islands, Taiwan, South Korea.

100V/50 and 60 Hz: Japan (See map on page 46 for guide to frequencies)

220-240V/50Hz: Most of the rest of the world. Note: Most of Europe, except the U.K., will be changing to 230VAC/50Hz power mains by 2003.

Note: *Since international voltages are about twice as high as the standard 120V used in North America, the amperages drawn by your product overseas will be almost half that drawn here at home. For example, a Class 1 product designed for use at 12A/120V in North America would draw 6-7A at the higher voltages—typically 220-240VAC—internationally.*

Plugs and Sockets: For Class I applications, there are nine main plug/socket groupings used throughout the world. These are illustrated in the introduction to the cord and cordset section beginning on page 15.

- Continental Europe: The German "Schuko" standard, also used in Austria, Belgium, Finland, France, the Netherlands, Norway, Sweden, Portugal and Spain.
- Australia/New Zealand/People's Republic of China.
- Argentina
- United Kingdom & Ireland.
- Denmark.
- India (old British standard BS 546).
- Israel.
- Italy.
- Japan.
- North America.
- Switzerland.

Note: The Argentine plug looks exactly like the Australian/New Zealand/Chinese plug, but there are important differences. First the nominal diameter of the Argentine plug face is 1mm smaller. Second, the nominal length of the contacts in the Argentine plug are 1mm longer. Finally, line and neutral on the Argentine plug are reversed in comparison with the Australian, New Zealand and Chinese plugs.

Cordage. There are two main cordage types used internationally: The AWG (American Wire Gauge) system used in North America, and the European Harmonized types. While the AWG system utilizes wire gauge sizes such as 16 or 18 AWG, the Harmonized cordage is described in terms of mm^2 (an 18AWG conductor is comparable to $0.75mm^2$). Do not use AWG cordage on products being shipped overseas!

The color coding of the conductors differs between the two types: North American conductors are typically black (L), white (N), and green (ground). Harmonized conductors are brown (L), blue (N), and green/yellow (ground).

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The other major difference between the two cordage types concerns marking requirements. See the Cordage section, pages 131-138 for more information.

Fuses. The International 5x20mm fuse is much smaller than the North American 3AG fuse (cp. 6 x 32mm) and the time-current characteristics differ substantially. Generally, specify international 5x20mm fuses for overseas applications and a North American 3AG for use in North America. Refer to the Fuse and Fuseholder section on pages 205-218 for strategies on specifying fuses on a "Universal Product."

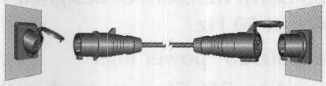
Finally, remember to allow for Internal component spacings appropriate for the final standard that you expect your product to meet.

Specifying Components in the "Universal Model" Approach

Although specification of each of the primary power or "critical" components in the universal model approach involves special considerations unique to that component, some general factors apply to all critical components.

It is best to select components which have major agency approvals. The appropriate approval list varies from component to component depending on practices of each individual agency and the availability of multiple suppliers, each of whom have the required approvals. The following guidelines apply to commonly specified components (Note: the components listed below will have UL recognition and CSA certification where possible).

Cords (or detachable **Cordsets** incorporating an IEC 60320* power connector) with power plugs appropriate for each country. Note: Utilizing an IEC 60320* power inlet on your product will make it easy to switch cordsets to the correct power plug for your international market. Approvals on cords and cordsets are mandatory in every European country except Portugal, Spain, France, Italy and Greece. They are also required for Japan.



IEC 60309* High power plugs and sockets (to 125A):
Because of slight differences between European and North American standards, few manufacturers at present offer IEC 60309* connectors that have UL/CSA and VDE approvals. Panel Components Corporation's new line of Interpower™ IEC 60309* connectors does carry UL, CSA, and VDE approvals on many models. It is not possible on some plug/connector pairs. Remember that cordage differences require the use of AWG cordage for North American applications and Harmonized cordage for overseas markets. See pages 117-130.

Cordage. Specify Harmonized cordage on products being shipped overseas. Do not use AWG cordage on export products! Harmonized cordage requires only one approval, such as VDE, when HAR mark is used (work on wording here). See the Cordage section, pages 131-138 for more information.

IEC 60320* connectors. Approvals are mandatory in every European country except the United Kingdom, Portugal, Spain, France, Italy and Greece.

Accessory Power Connectors: Be sure to specify IEC 60320* appliance outlets for accessory power connections, as the NEMA 5-15R accessory outlet is not used internationally. IEC 60320* appliance outlets and their mating plug connectors or interconnection cord sets are widely used for accessory power applications. They are now available with agency approvals. British regulations require the use of a shuttered appliance outlet in some applications.

Fuses. The International 5x20mm fuse is much smaller than the North American 3AG fuse (cp. 6 x 32mm) and the time-current characteristics differ substantially. Generally, specify international 5x20mm fuses for overseas applications and a North American 3AG for use in North America. Refer to the Fuse and Fuseholder section on pages 205-218 for strategies on specifying fuses on a "Universal Product."

Fuseholders with all major agency approvals that will accept either the North American ¼ x 1 ¼ inch or the international 5 x 20 mm fuse (or a circuit breaker). VDE and SEMKO approvals are important. Other agencies either do not test fuseholders or they do not require formal testing of the fuseholder.

Power switches: Note that several of the European plug types are not polarized; therefore a double-pole switch is used. Switches with approvals from UL, CSA, VDE, SEMKO, NEMKO, FIMKO, DEMKO, KEMA, and SEV are available from several sources. Some suppliers may offer one or two additional approvals on some models.

Transformers (with primary winding designed for use with a voltage selector), **wire**, and **construction practices** that satisfy all major agency requirements.

RFI power line filters: It is important to determine that a particular line filter was certified for use in your type of product. This is particularly true of filters used in computers. Careful examination of the agency certification license will help. VDE approval is important. Some suppliers offer SEMKO and SEV; however, these agencies have on occasion accepted VDE approved filters in products being tested.

Voltage Selectors: VDE will test voltage selectors; however, other agencies do not test and approve voltage selectors because they are not recognized as a separate category of switch in applicable IEC publications. The emphasis in most agencies is on the electrical rating, how the voltage selector is installed, and how accessible it is to non-technical users.

Power Supplies When power supplies are purchased from vendors, they should carry UL, CSA and VDE test marks. Furthermore, the test certificate should indicate that they were tested in accordance with the requirements dictated by the end use. For example, not all power supplies which carry UL, CSA and VDE test marks satisfy the requirements of IEC 60950/EN60950 which addresses information technology equipment.

Relays and **indicators** with all major agency approvals.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Specifying Power Cords for Medical Products Sold In International Markets

North American requirements for power cords used in medical products mandate the use of special, very robust plugs that are designed to withstand substantial pull-out forces between the power cable and the plug without failing. The plug is also designed to offer substantial impact resistance and to generally withstand the rigors of a tough environment.

Power cordage may also incorporate special features that substantially reduce the interconductor leakage currents. This low leakage cordage is specified whenever low leakage currents for the load and its power cord are of paramount importance.

Because many North American designers of medical equipment are familiar with these practices, they expect that foreign medical equipment standards will be similar. In fact, the only country in which there are any differences for power cords used in medical equipment is Australia.

The Australian medical equipment standard **recommends** but does not mandate the use of a plug that is molded of a clear PVC material. The objective is to simplify the visual inspection of the integrity of the ground contact. In addition, although not mandatory, it is common practice in Australian hospitals to use power cords and cordsets that are manufactured with orange cordage. Otherwise, the cord or cordset is standard.

In Europe, and for that matter the rest of the world, there are no requirements for special plugs nor are there special provisions for special cordage used with medical equipment.

Designing for Compliance: Some Strategies

Strategy #1:

Design a different model for each set of safety requirements

This approach typically involves the design of one model of a product for sale in North American markets where the voltages are 120 volts at 60 Hz and a second model for sale in export markets where power supply voltages range, for the most part, from 100-250 volts at 50 Hz.

This approach is especially attractive in those situations in which the power supply cannot conveniently be designed to switch between voltages and frequency ratings. A country-specific strategy with a permanently attached power cord may provide a cost-effective alternative where large volumes of low value products are being shipped into one market (hair driers to Germany, for example).

To aid you in preparing products for specific countries, see the "Guide to Worldwide Plug/Socket Standards, Voltages and Single-phase Frequencies" fold-out poster in the Designer's Reference section.

Strategy #2:

Design ONE (Universal) model to be sold in all markets (see page 12)

This approach is the choice of a growing number of designers and manufacturers because it allows one single product to be manufactured and sold worldwide. This approach is especially advantageous for the North American equipment manufacturer, who currently enjoys the the largest homogeneous home market in the world.

The advantage of economies of scale can frequently be translated into a significant competitive edge in markets in which the competition is essentially local in character.

Strategy #3:

U.S. input: 240V
International input: 220-240V

One design approach which will minimize but not eliminate differences between North American and export models of higher current products is to utilize a 240 volt input for the U.S. and 220-240 volts for export markets. Although this will not eliminate the need for different power cords depending on market, it will allow common circuit protection and power supply, provided that the power supply accepts 50 and 60 Hz power.

One development that makes this alternative more attractive is the European decision to shift to a 230VAC electrical distribution system (from 220 and 240 VAC systems) by the mid 1990s (see inset on page 12 for more information). Please note that this is **not an option for equipment with 3-phase power inputs** since the most standard three phase inputs are 208 volts in North America and 220-400 volts in export markets.

Strategy #4:

Exporting products already designed for the U.S. only

Finally, manufacturers occasionally are interested in exporting, in small quantities, products already designed which comply with North American requirements only. Because of the small quantities involved, it may not be economical to redesign them to operate at 220-240 VAC/50 Hz. Furthermore, if these products are used in industrial or commercial environments, agency approvals are desirable, but not essential.

The manufacturer can still export a user-friendly product with minimal re-engineering by adding:

- a step-down transformer designed for service at 50 Hz
- an IEC 60320* power inlet
- appropriate RFI filtering so that the product satisfies European EMC regulations
- a circuit protection device
- an appropriate cordset (or power cord if the load exceeds 10A at 220 VAC).

This solution will work if the power supply will operate on 50 Hz power. If it operates only on 60 Hz power, a 50-60 Hz power supply may be necessary. Transformers with these specifications are described on page 226. It is important to assure that the product does qualify for a CE Mark.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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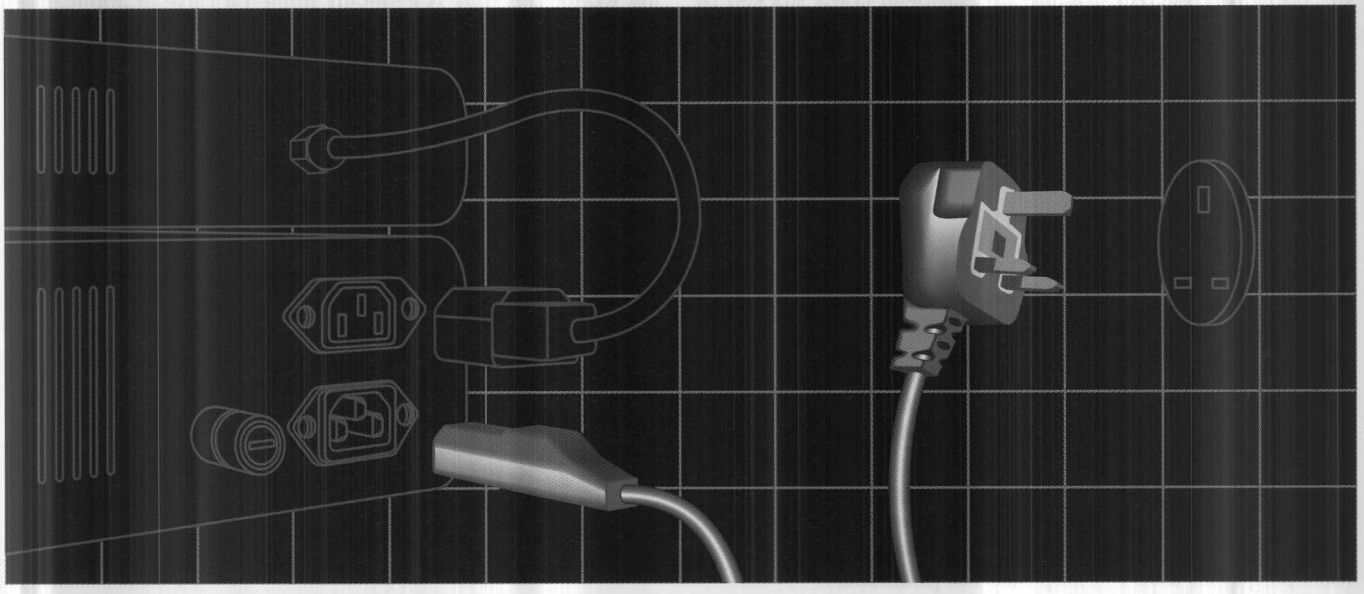
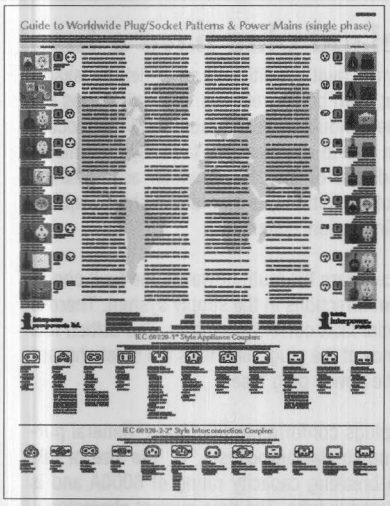
Cords & Cordsets



Specifying International Cords and Cordsets

Selection of the appropriate cord or cordset for each export market is one of the easiest steps any equipment designer can take to assure that the product can be easily plugged in and used by your overseas customer. (A cordset is defined in this catalog as a cord terminated with an IEC 60320* power connector.) The cord/cordset specification process involves; 1) identification of the correct power plug; 2) the desired rating of the cord or cordset (see Selection Chart on pages 21-22); 3) cordage appropriate for the country of use; and 4) an IEC 60320* power connector.

World Plug and Socket Standards

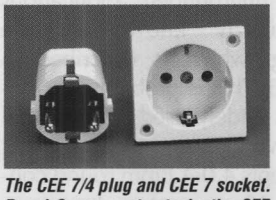


Refer to fold-out poster for a country-by-country cross reference and a guide to single-phase voltages and frequencies.

For 3-wire, Class I grounded cords with current ratings up to 16A (this varies from 10-16A depending on country and agency), there are 12 standard plug/socket types in use throughout the world. Note that each plug type has been assigned a letter key. Use the letter key in other product sections of this catalog and with the "Guide to World Plug and Socket Standards, Voltage & Frequencies" fold-out poster to determine the plugs used in countries not listed in this introduction.

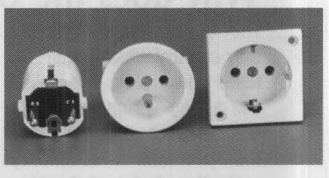
Continental European "Schuko"—an important international standard

230V/50Hz; 16A max.



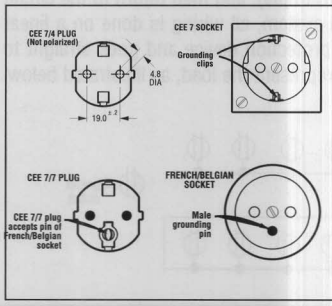
The CEE 7/4 plug and CEE 7 socket. Panel Components stocks the CEE 7/7 plug below (see pages 23-24 & 90-92).

The standard, Class I grounded mains, plugs used in Germany, Austria, the Netherlands, Sweden, Norway, and Finland are the **CEE 7/4** and **CEE 7/7** (also known as "Schuko") plugs. Because this standard is used so commonly throughout Europe, we refer to it as the "Continental European" standard.



The CEE 7/7 plug (left, see page 90), French/Belgian socket (center, see page 95), Schuko socket (right, see page 90) .

Both styles have two 4.8mm round contacts on 19mm centers. Grounding is achieved through the grounding clips on the sides of the plug body. The CEE 7/7 plug also has a female receptacle which permits it to be

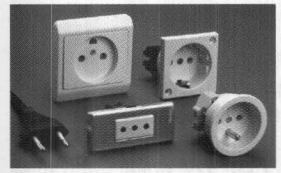


The CEE 7/4 plug has two 4.8 mm round contacts on 19 mm centers and two grounding clips on the sides of the plug body.

The CEE 7/7 plug was developed to bridge the differences between the "Schuko" plug/socket system and the connection system used in France and Belgium. This plug is also unpolarized except when it is used in French and Belgian sockets.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Practices diverge most in the area of polarization. Typically, Europeans don't maintain consistent identification of line and neutral throughout their power system as is the practice in North America. Consistent with this practice, the Schuko plug can be rotated to either of two positions and plugged into the socket. Thus the common electrical system in Europe is unpolarized (i.e., line and neutral are connected at random), and, in fact, most plug types used in Europe are not polarized.



Europlug

230V/50Hz; 2.5A max.

The Europlug mates with all standard wall sockets used in Continental Europe. Europlug models are shown on page 92.

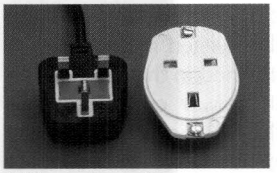
The standard 2-wire plug used in Class II, ungrounded, applications is popularly known as the Europlug, which is described in CEE 7/16. This is probably the single most widely used international plug. It will mate with any socket that accepts 4.0-4.8mm round contacts on 19mm centers. It is com-

Australian cords are shown on pages 30-33; socket on page 93-94.

depth from plug face. (Since August 6, 1994, old style models are no longer allowed to be used on equipment shipped to Australia. Note that the cords and plugs in this catalog *do* meet the new requirements.) The Australian system is standard in New Zealand and Papua New Guinea. Standard plug and socket rating is 10A, but 15 and 20A models are also available.

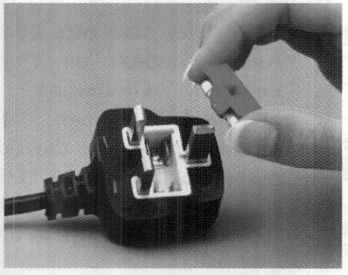
United Kingdom/ Ireland

230V/50Hz; 13A max.



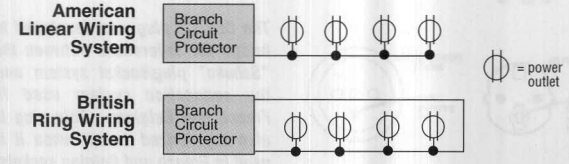
British cords are shown on pages 61-66; socket on page 113-114.

British standard **BS 1363** requires use of a 3-wire grounded and fused plug for **all** connections to the power mains (including Class II, 2-wire appliances). See inset below for explanation of fusing requirements. British power outlets incorporate shutters on line and neutral contacts to prevent someone from pushing a foreign object into the socket. The plug is rated at 3-



Why does the United Kingdom/Ireland plug have a fuse?

The United Kingdom is the only country which requires a fused power plug. The British use a ring wiring system in their houses and buildings that provides a secondary protection device at the plug to minimize safety hazards. Circuits leave the local branch protection device, travel out to the loads (outlets or lamps, for example), and then return to the circuit protection device. In the American system, all wiring is done on a linear basis—a circuit leaves the circuit protection device and goes straight to the outlets or lighting circuits that represent the load, as illustrated below.



In the British ring wiring system, a fault condition at an outlet, for example, will be sourced with current from both directions. This minimizes the amount of heat generated in the conductor, as the fault condition occurs but before the circuit protection device can clear the fault. By minimizing the heat generated, the degradation of insulation (which accompanies overheating due to repeated fault conditions) is also diminished, improving the long-term safety of the insulation system.

Until the circuit protection device clears the fault, however, the fault condition is sourced from two different directions in the supply system. There is therefore a much greater potential fault current condition. The British feel that a secondary protection device at the plug minimizes the safety hazard this condition creates; hence, the power plug fuse.

The fuse installed in all British plugs conforms to BS 1362 ("General purpose fuse links for domestic and similar purposes..."). The size of this fuse is 6.3 x 25.4mm. It has a breaking capacity rating of 6000A and is constructed with a sand-filled ceramic tube. The time-current characteristic on this family of fuses is not necessarily consistent with any other international standard, but it appears to have most of the characteristics of a fast acting fuse. The British Standards Institution standard for fuses in general is BS 4265.

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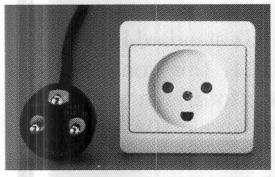
13A, depending on the fuse. BS 1363 was published in 1962 and since that time it has gradually replaced the earlier standard plugs and sockets (BS 546). The BS 1363 plug is also used in Ireland, Hong Kong, Malaysia, and Singapore.

Denmark

230V/50Hz; 10A max.

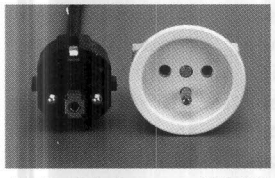


Danish cords are shown on page 35-37; socket on page 95. Be sure to use a Danish cord on products exported to Denmark!

The Danish standard is described in **Afsnit 107-2-D1** and is unique to Denmark. The Danish socket will also accept either the CEE 7/4 or CEE 7/7 plugs; however, **there is no grounding connection** with these plugs because a male ground pin is required on the plug. The correct plug **must** be used in Denmark for safety reasons. A variation of this plug intended for use only on surge protected computer circuits has been introduced—see inset below. The current rating on both plugs is 10A.

France/Belgium

230V/50Hz; 16A max.

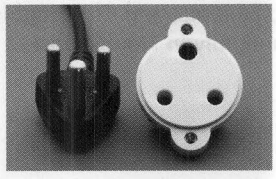


Continental European CEE 7/7 plugs accept the grounding pin of French and Belgian sockets. See pages 23-26 for cords; page 95for sockets.

France and Belgium have a standard socket which is **not** compatible with the CEE 7 socket that is standard in Germany and other continental European countries. The reason for incompatibility is that grounding in the French/Belgian socket is accomplished with a round male pin permanently mounted in the socket. The **CEE 7/7** plug bridges the differences between the two types of sockets. It has grounding clips on both sides to mate with the CEE 7 socket and a female contact to accept the grounding pin of the French/Belgian socket. Note that the CEE 7/7 plug is polarized when used in the French and Belgian electrical system.

India/South Africa

220-230V/50Hz; 15A max.

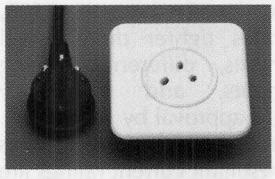


Indian cordset is shown on page 38-40; socket on page 96.

India has standardized on a plug which was originally defined in British Standard 546 (the standard in the United Kingdom before 1962). It is rated at 15A and is also used in Nepal, parts of Southern Africa, and other areas electrified by the British.

Israel

220V/50Hz; 16A max.



The Israeli plug is used only in Israel. It is rated at 16A. Cordset is shown on page 41-43; socket on page 96.

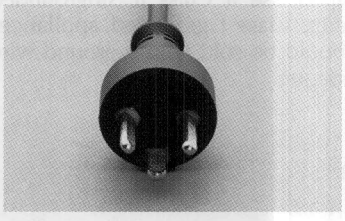
Israel's standard plug pattern, defined in **SI 32**, is unique to Israel and is incompatible with all other plugs. (Except for the Europlug which is used for Class II applications in Israel.) It is rated at 16A.

Data Circuits—Danish and British

Computers and other electrical devices that contain sensitive digital circuits usually need to be protected from spikes and surge currents conducted into the product via the line cord. In North America, this is normally accomplished with the use of plug-in surge protectors that are dedicated to one computer or work station.

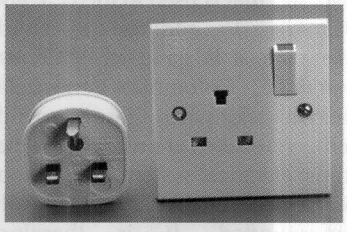
Although not yet as common in Europe as in the U.S., surge protection is frequently provided in Europe through the use of centrally protected circuits. In these installations, a power distribution system that can exclude non-protected appliances is desirable. The reason is that the presence of an inductive load, such as a vacuum cleaner for example, on a protected circuit would potentially reinsert brush noise and spikes as the vacuum was turned on and off. This could completely negate the central surge protection.

The basis of the selective connection systems used in Denmark and the U.K. is the plug and socket. The Danish plug/socket is a Danish national standard. The British do not have an official standard on plugs and sockets for data circuits and there is in fact at least one other plug/socket system used by a large British computer manufacturer.



Danish data plug

The Danish plug/socket pair is designed with specially shaped line and neutral contacts. The protected socket (not shown) will accept only the Danish data circuit plug; however, this data circuit plug may also be inserted into a standard outlet if a protected outlet is not available.



British data plug and socket

The British plug/socket pair designed for use with protected data circuits incorporates a special "T" shaped ground contact that allows the data circuit plug to connect only to a protected outlet. The outlet, similarly, excludes all other standard plugs.

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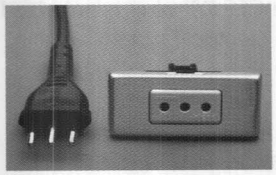
Italy

230V/50Hz; 10A (or 16A) max.

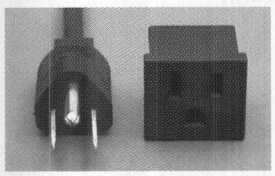


The Italian standard includes two different plugs rated at 10 and 16A. 10A cordsets are shown on page 44-45; sockets on page 97.

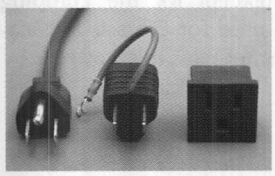
The Italian grounded plug/socket standard, **CEI 23-16/VII,** includes two styles rated at 10 and 16 A and differ in terms of contact diameter and spacing. Because they can be inserted in either direction at random, they are unpolarized. The Italian system is relatively standardized in Libya, Ethiopia, and Chile and is found randomly in North Africa.

Japan

100-110V/50Hz and 60HZ; 15A max.



Japanese cordsets are shown on page 46-48; we do not currently stock a socket with Japanese approvals.



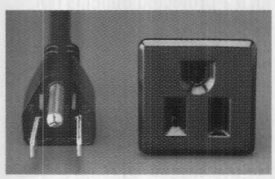
It is common to use a Class II type plug or to equip a Class I plug with an adapter on products going to Japan. See page 97 for adapter.

The Japanese plug and socket, on first glance, is identical to the North American NEMA 5-15 standard. However, the Japanese system, which is described in JIS 8303, incorporates tighter dimensional requirements, different marking requirements, and mandatory testing and approval by MITI or JIS. Furthermore, standard wire sizes and the resultant current ratings are different than those used elsewhere in the world.

In addition, Class I grounded sockets are used less frequently in Japan than in the U.S. with the result that most appliances sold in Japan use a Class II, ungrounded plug. Class I grounded appliances should be sold with a ground wire adapter.

North America

120V/60Hz; 15A max.

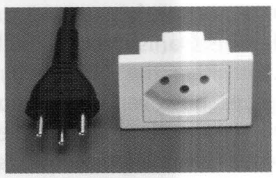


The NEMA 5-15 plug commonly used in the U.S. and Canada is also an important international standard. It is used in Central America and parts of South America. North American cords are shown on pages 49-54; socket, page 110.

The standard NEMA 5-15 plug and socket system (in Canada, CS22.2, No. 42) that is used in the U.S. and Canada. In addition to North America, it is standard in Central America, Colombia, Venezuela, and Ecuador when Class I, grounded connections are used. Note that most electrical systems in developing countries are usually ungrounded. It is therefore common for equipment users to simply cut off the ground pin so that the plug can be mated with a 2-blade, ungrounded socket. This of course eliminates the safety ground connection. This plug is rated at 15A. Other NEMA plug and socket configurations permit power connections at higher amperage and voltage ratings. See pages 99-107 for higher rated models.

Switzerland

230V/50Hz; 10A max.

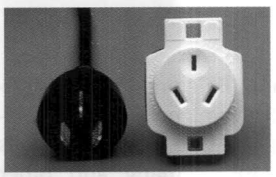


Swiss cords are shown on page 59-60; socket on page 112.

Switzerland's standard is described in **SEV 1011**. This connector system is rated for use in applications up to 10A. Above 10A, equipment must be either wired permanently to the electrical supply system with appropriate branch circuit protection or connected to the mains with an appropriate high power industrial connector.

Argentina

250V/50Hz; 10A max.

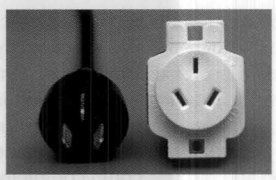


Argentine cords are shown on page 28-29.

The standard plug for Argentina, defined by IRAM 2073:1982, also resembles the Australian pattern in appearance. However, the Argentinian plug differs greatly from that used in Australia or China. The pins are one millimeter longer than those of the Australian version and there are slight differences in the specified body dimensions. The most important difference lies in how the Argentinian plug is wired. The positions of the line and neutral contact pins are reversed from those of the Australian plug. For this reason, great care must be taken when manufacturing equipment for export to both Australia and Argentina, as well as specifying the correct cord or cordset for use with equipment. The Argentinian plugs are rated 10A/250V at 50Hz and carry IRAM.

China

250V/50Hz; 10A max.



Chinese cords are shown on page 34.

The plug and socket pattern for use in China is specified in publications GB2099.1-1996 and GB 1002-1996. The plug is nearly identical to the Australian plug pattern except for a few minor differences. The contact pins of the Chinese plug are slightly longer (1mm) than the Australian contact pins. Plug body dimensions may also vary slightly. China requires that plugs, connector couplers, and cable used in the construction of the Chinese cordsets be tested and approved by the China Commission for Conformity Certification of Electrical Equipment (CCEE) and must bear the CCEE mark (commonly

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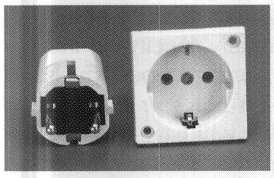
referred to as the Great Wall Mark). Panel Components Corporation's Chinese powercord and cordset are rated at 10A/250V max. at 50Hz.

Russia

220V/50Hz

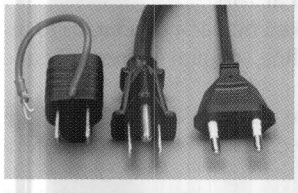


Panel Components Corporation recommends the standard Schuko 7/4 or 7/7 plug on products being exported to former East Bloc countries and to the Soviet Republics. Note that the larger contact size (4.8mm) of this plug will make this plug a tight fit in the Russian socket.

The Soviet Republics use a standard plug and socket defined in Russian Standard Gost 7396 which is similar to the Schuko (German) standard. Contacts are also on 19mm centers, but the diameter of this contact is 4.0mm compared to 4.8mm which is standard in Continental Europe. Reliable information on Eastern European standards is still difficult to access. The standard used in the former Yugoslavia is virtually identical to the Schuko standard. Furthermore, one of the protocols governing the reunification of Germany provided that the DIN and VDE standards would prevail **without exception.** The former East Germany was required to conform to the Schuko standard.

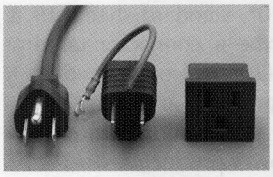
It appears that most if not all of the Eastern European countries generally use the Schuko standard internally but, until recently, they exported appliances to the Soviet Union with the Soviet standard plug installed. Because the volumes of appliance exports to the Soviet Union were large, the Soviet plug has found its way into use in Eastern Europe as well. Panel Components Corporation recommends that North American manufacturers utilize the standard Schuko plug when exporting products to these countries.

Power Connections in Developing Countries



Most third world systems are ungrounded. The standard U.S. cord plus grounding adapter and the ungrounded Eurocord are commonly used plugs in these situations.

Information on electrical systems used in developing countries is imprecise at best. Formal electrical standards, where they exist at all, frequently do not cover plugs and sockets or are ignored in the marketplace. Furthermore, with regard to voltages and frequencies, power generating and distribution systems have been installed at various times by different contractors. These systems occasionally produce power at different frequencies and provide for final distribution at different voltages. Therefore, some cities—even individual buildings in those cities—may be supplied by two or more generating plants and power distribution systems, each with a different single-phase voltage and frequency.



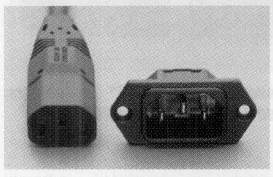
The standard U.S. cord plus grounding adapter can be used in Central America and parts of South America.

Most third world electrical distribution systems are ungrounded, hence three-contact, grounded plugs, while mateable with the sockets, are not necessarily providing the expected equipment ground. Alternative methods of equipment ground is advisable in these cases.

An ungrounded version of the North American NEMA 5-15P plug is commonly used in Central America and parts of South America. It is therefore common for equipment users to simply cut off the ground pin so that the plug can be mated with a 2 pole, ungrounded socket. (Panel Components Corporation offers a Class I to Class II adapter—see page 97.) Another common international standard is an ungrounded version of the Continental European (German "Schuko") standard.

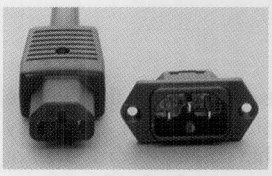
See the "Guide to Worldwide Plug/Socket Standards" fold-out poster for country-by-country plug/socket recommendations.

IEC 60320* Power & Accessory Power Connections



"Cold Connectors" are rated 10 international (15A UL & CSA). Cordsets with molded-on cable connectors are available for most countries; rewirable models and inlets are shown on pages 190-194.

Whenever a detachable cordset is used, an equipment connector pair must be included in the specification. The connector which is by far the most standard throughout the world is defined in IEC publication 60320*, standard sheets C13 and C14. It is rated by most agencies for service at 65°C. UL and CSA allows its use at 15A; European agencies have increased the current rating from 6 to 10A (220-240VAC). It is possible when using cordsets, that incorporate this connector, to connect power to a product with any of 12 different cordsets. The product then can be easily modified to operate anywhere in the world. These IEC 60320* connectors are shown on pages 190-191.



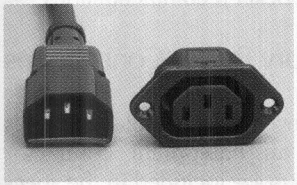
"Hot" IEC 60320 connector described in IEC 60320* sheets C15 and C16 is designed for use to 10A (15A UL/CSA) at 120°C. Connector & inlet shown on pages 190-194.*

A second connector described in IEC publication 60320*, standard sheets C15 and C16, is also used fairly frequently. It is intended for service in higher temperature applications with service to 120°C and a current rating of 10A. It has usually been used by North American equipment producers for its 10A rating and only rarely for its higher temperature capability. This connector system incorporates a keyway which prevents entry of "cold" cable terminated connectors described in IEC 60320* standard sheets C13 and C14. Although it is theoretically possible to mold this connector directly onto power cordage, the C15 and C16 connector is generally specified as a rewireable device.

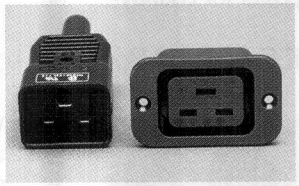
* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

for accessory power applications is **not** recommended for use on exported products.

See pages 195-200 for more information on International Accessory Power Connections.



"Reverse" IEC 60320 connectors should be used to power accessories on products being exported; do not use NEMA-style sockets. Accessory connectors are shown on pages 198-199.*



"Reverse" IEC 60320 connectors rated 16-20A; see page 200.*

Cordage Considerations

Determine jacket abrasion resistance needed for use on your product. PCC cords and cordsets are PVC jacketed and generally rated for use in off-the-floor office situations (note that we can prepare made-to-order cable assemblies with rubber cordage for harder service usage; contact us for more information). See Page 263 of the Designer's Reference section for assistance in specifying cordage.

Shielded cords

The use of shielded cords and cordsets on products that will be sold internationally presents special problems from an agency approval point of view. The reason is that shielded cords are not specifically covered by existing cordage standards. This means that most European agencies will not provide a component level approval on shielded cords. The equipment manufacturer may be forced to incur the extra costs in getting an applications approval to use the shielded cordset. VDE has tested and approved shielded cordsets in the past and therefore in Germany, at least, this may not be an overwhelming problem. Other countries, however, may not accept shielded cordsets. In

and will reference the molded-on appliance connector, again with reference to one or more specific cordage types. The third will cover the cordage itself.

Most European agencies require that agency markings be molded directly into molded-on plugs and connectors. The cordage itself will have required marks either on the jacket or on the primary insulation or alternatively it will incorporate a color-coded thread that will identify the manufacturer. Australian, American and Canadian authorities call for different procedures. The Australian agencies require that an approval number be molded into the plug and appliance connector and that the cordage be surface marked with information that also includes this approval number. UL does not require that their mark be molded directly into the cord; however, it does require surface marking of the cordage with the manufacturer's file number. Furthermore, cords must be tagged on the cartons or in bundles with markings that conform to UL regulations. CSA's requirements are similar to UL's except that they require a CSA sticker on each cord that conforms to CSA requirements.

PCC Cord & Cordsets are 100% Tested

Cords and cordsets are tested using the following procedures:

1. Ground continuity is determined at 25A.
2. Polarity and continuity are checked on each conductor to assure that line is connected to line, neutral to neutral, and ground to ground.
3. High voltage breakdown tests are performed at 2500 VAC for one second between the primary conductors and ground conductor.
4. All plugs, connectors and cordage are subject to visual inspection for surface quality, molding flash, markings,etc.
5. Length of cord/cordsets is checked on a random sample basis.

Plug, Cordage & Connector Specifications

Plug specifications (polarization drawings, ratings, approvals, etc.) are given at the beginning of each country section. Cordage specifications are given below the illustration of each cord or cordset. Connector specifications are referenced by each cord and are shown on pages 72-73.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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Cord & Cordset Selection Chart (organized by amps)

International & North American Cords & Cordsets

Part Number	Notes	See Page	Current Rating	Conductor Size	Cord*	Cordset*	Aegis	Europe: Austria	Belgium	Denmark	Finland	France	Italy	Germany	Netherlands	Norway	Spain/Portugal	Sweden	Switzerland	U.K./Ireland	N.A.: Canada	Mexico/Central Amer.	U.S.	Other: Argentina	Australia/N.Zealand	Baltic States	China	India/S.Africa	Israel	Japan	Russia
86557100	C5	51	2.5A/125V	2x18AWG		✔															■		■								
86532032		27	2.5A/250V	2x0.75mm²	✔			■	■	■	■	■	■	■	■	■	■	■	■			■	■								
86532100		27	2.5A/250V	2x0.75mm²		✔		■	■	■	■	■	■	■	■	■	■	■	■												
86532110	Class II	31	2.5A/250V	2x0.75mm²		✔																			■						
86532130	Class II	38	2.5A/250V	2x0.75mm²		✔																						■			
86552100		62	2.5A/250V	2x0.75mm²		✔														■											
86557120	C5	31	2.5A/250V	2x0.75mm²		✔																			■						
86557130	C5	24	2.5A/250V	2x0.75mm²		✔		■	■		■	■		■	■	■	■	■													
86557140	C5	62	2.5A/250V	2x0.75mm²		✔														■											
86557150	C5	38	2.5A/250V	2x0.75mm²		✔																						■			
86557160	C5	36	2.5A/250V	2x0.75mm²		✔				■																					
86557170	C5	59	2.5A/250V	2x0.75mm²		✔													■												
86557180	C5	44	2.5A/250V	2x0.75mm²		✔							■																		
86557190	C5	41	2.5A/250V	2x0.75mm²		✔																							■		
86532120	Class II	51	3A/125V	2x18AWG		✔															■	■	■								
86532140	Class II	47	3A/125V	2x0.75mm²		✔																								■	
86557110	C5	47	3A/125V	2x0.75mm²			✔																							■	
86583000		62	3A/250V	3x1.00mm²		✔	✔													■											
86552046		63	5A/250V	3x1.00mm²		✔	✔													■											
86590012		63	5A/250V	3x0.75mm²	✔		✔													■											
86230010		27	6A/250V	3x0.75mm²	✔		✔	■	■		■	■		■	■	■	■	■													
86589000		48	7A/125V	3x0.75mm²			✔																							■	
86560010	Class II/Rubber	57	10A/125V	2x18AWG	✔																■	■	■								
86560030	Rubber	57	10A/125V	3x18AWG	✔																■	■	■								
86610301	Medical/Clear	57	10A/125V	3x18AWG		✔															■	■	■								
86610400	Medical/Clear	56	10A/125V	3x18AWG	✔																■	■	■								
86610500	Medical/Gray	57	10A/125V	3x18AWG		✔															■	■	■								
86610600	Medical/Clear	56	10A/125V	3x18AWG	✔																■	■	■								
86610610	Medical/Clear	55	10A/125V	3x18AWG		✔															■	■	■								
86610620	Medical/Clear	55	10A/125V	3x18AWG		✔															■	■	■								
86610630	Medical/Clear	55	10A/125V	3x18AWG		✔															■	■	■								
86610640	Medical/Clear	56	10A/125V	3x18AWG		✔															■	■	■								
86610650	Medical/Clear	56	10A/125V	3x18AWG		✔															■	■	■								
86610700	Medical/Black	56	10A/125V	3x18AWG	✔																■	■	■								
86610710	Medical/Black	55	10A/125V	3x18AWG		✔															■	■	■								
86610720	Medical/Black	55	10A/125V	3x18AWG		✔															■	■	■								
86610730	Medical/Black	55	10A/125V	3x18AWG		✔															■	■	■								
86610740	Medical/Black	56	10A/125V	3x18AWG		✔															■	■	■								
86610750	Medical/Black	56	10A/125V	3x18AWG		✔															■	■	■								
86610800	Medical/Gray	56	10A/125V	3x18AWG	✔																■	■	■								
86610810	Medical/Gray	55	10A/125V	3x18AWG		✔															■	■	■								
86610820	Medical/Gray	55	10A/125V	3x18AWG		✔															■	■	■								
86610830	Medical/Gray	55	10A/125V	3x18AWG		✔															■	■	■								
86610840	Medical/Gray	56	10A/125V	3x18AWG		✔															■	■	■								
86610850	Medical/Gray	56	10A/125V	3x18AWG		✔															■	■	■								
70401020244		52	10A/125V	3x18AWG		✔															■	■	■								
70401000183		51	10A/125V	3x18AWG	✔																■	■	■								
70401020091		52	10A/125V	3x18AWG		✔															■	■	■								
70405000183		51	10A/125V	3x18AWG	✔																■	■	■								
70405020234		52	10A/125V	3x18AWG		✔															■	■	■								
70405030234		53	10A/125V	3x18AWG		✔															■	■	■								
70405050234		53	10A/125V	3x18AWG		✔															■	■	■								
70405060234		53	10A/125V	3x18AWG		✔															■	■	■								
70405070234		52	10A/125V	3x18AWG		✔															■	■	■								
86230110		25	10A/250V	3x1.00mm²		✔	✔	■	■		■	■		■	■	■		■													
86230050		24	10A/250V	3x1.00mm²		✔	✔	■	■		■	■		■	■	■		■													
86230060		25	10A/250V	3x1.00mm²		✔	✔	■	■		■	■		■	■	■		■													
86396000		60	10A/250V	3x1.00mm²		✔	✔												■												
86210030		31	10A/250V	3x1.00mm²		✔																									

Cord & Cordset Selection Chart, cont. (organized by amps)

International & North American Cords & Cordsets									Europe														N.A.			Other								
Part Number	Notes	See Page	Current Rating	Conductor Size	Cord[1]	Cordset[1]	Aegis[2]	Austria	Belgium	Denmark	Finland	France	Italy	Germany	Netherlands	Norway	Spain/Portugal	Sweden	Switzerland	U.K./Ireland	Canada	Mexico/Central Amer.	U.S.	Argentina	Australia/N.Zealand	Baltic States	China	India/S.Africa	Israel	Japan	Russia
86516080	Medical	31	10A/250V	3x1.00mm²		✔																			■							
86390010		28	10A/250V	3x1.00mm²		✔																		■								
86517020		28	10A/250V	3x1.00mm²	✔																			■								
86230020		24	10A/250V	3x1.00mm²	✔		✔	■	■		■	■		■	■	■	■	■														
86517040		34	10A/250V	3x1.00mm²		✔																					■					
86517050		34	10A/250V	3x1.00mm²	✔																						■					
86230040		24	10A/250V	3x1.00mm²	✔		✔	■	■		■	■		■	■	■	■	■														
86521040		59	10A/250V	3x1.00mm²	✔		✔													■												
86210020		31	10A/250V	3x1.00mm²	✔		✔																			■						
86344000		45	10A/250V	3x1.00mm²		✔	✔						■																			
86391000		37	10A/250V	3x1.00mm²		✔	✔			■																						
86536060	Data Circuit	36	10A/250V	3x1.00mm²		✔	✔			■																						
86539030		36	10A/250V	3x1.00mm²	✔		✔			■											■											
86397010		65	10A/250V	3x1.00mm²		✔	✔														■											
86554004		63	10A/250V	3x1.00mm²	✔		✔														■											
86393000		42	10A/250V	3x1.00mm²		✔	✔																							■		
86392000		39	10A/250V	3x1.00mm²		✔	✔																						■			
86397060		64	10A/250V	3x1.00mm²		✔	✔														■											
86584000		63	10A/250V	3x1.00mm²	✔		✔														■											
70006020300	IEC 60320* cord	67	10A/250V	3x1.00mm²	✔		✔	■	■	■	■	■	■	■	■	■	■	■	■	■	■				■				■	■		
70006030300	IEC 60320* cord	67	10A/250V	3x1.00mm²		✔	✔	■	■	■	■	■	■	■	■	■	■	■	■	■					■				■	■		
86589030		48	12A/125V	3x1.25mm²		✔																									■	
86560020	Class II/Rubber	57	13A/125V	2x16AWG	✔																■	■	■									
86560040	Rubber	57	13A/125V	3x16AWG	✔																■	■	■									
86570100	100'Ext.Cord/ClassII	51	13A/125V	2x14AWG		✔															■	■	■									
86610900	Medical	56	13A/125V	3x16AWG	✔																■	■	■									
86610910	Medical	55	13A/125V	3x16AWG		✔															■	■	■									
86610920	Medical	55	13A/125V	3x16AWG		✔															■	■	■									
86610930	Medical	55	13A/125V	3x16AWG		✔															■	■	■									
86610940	Medical	56	13A/125V	3x16AWG		✔															■	■	■									
86610950	Medical	56	13A/125V	3x16AWG		✔															■	■	■									
86611000	Medical	56	13A/125V	3x16AWG	✔																■	■	■									
86611010	Medical	55	13A/125V	3x16AWG		✔															■	■	■									
86611020	Medical	55	13A/125V	3x16AWG		✔															■	■	■									
86611030	Medical	55	13A/125V	3x16AWG		✔															■	■	■									
86611040	Medical	56	13A/125V	3x16AWG		✔															■	■	■									
86611050	Medical	56	13A/125V	3x16AWG		✔															■	■	■									
86611100	Medical	56	13A/125V	3x16AWG	✔																■	■	■									
86611110	Medical	55	13A/125V	3x16AWG		✔															■	■	■									
86611120	Medical	55	13A/125V	3x16AWG		✔															■	■	■									
86611130	Medical	55	13A/125V	3x16AWG		✔															■	■	■									
86611140	Medical	56	13A/125V	3x16AWG		✔															■	■	■									
86611150	Medical	56	13A/125V	3x16AWG		✔															■	■	■									
70403000183		51	13A/125V	3x16AWG	✔																■	■	■									
70403000305		51	13A/125V	3x16AWG	✔																■	■	■									
70403020031		52	13A/125V	3x16AWG		✔															■	■	■									
70403030031		53	13A/125V	3x16AWG		✔															■	■	■									
70403050183		53	13A/125V	3x16AWG		✔															■	■	■									
70403060183		53	13A/125V	3x16AWG		✔															■	■	■									
70403070183		52	13A/125V	3x16AWG		✔															■	■	■									
86560050	Rubber	57	15A/125V	3x14AWG	✔																■	■	■									
86589010		48	15A/125V	3x2.00mm²		✔																									■	
70404000183		51	15A/125V	3x14AWG	✔																■	■	■									
86230100		26	16A/250V	3x1.50mm²	✔		✔	■	■		■	■		■	■	■	■	■														
86230120		26	16A/250V	3x1.50mm²	✔		✔	■	■		■	■		■	■	■	■	■														
70009110250	IEC 60320* cord	69	16A/250V	3x1.50mm²	✔			■						■											■							
70025110250	IEC 60320* cord	69	20A/125V	3x12AWG	✔																■	■	■									

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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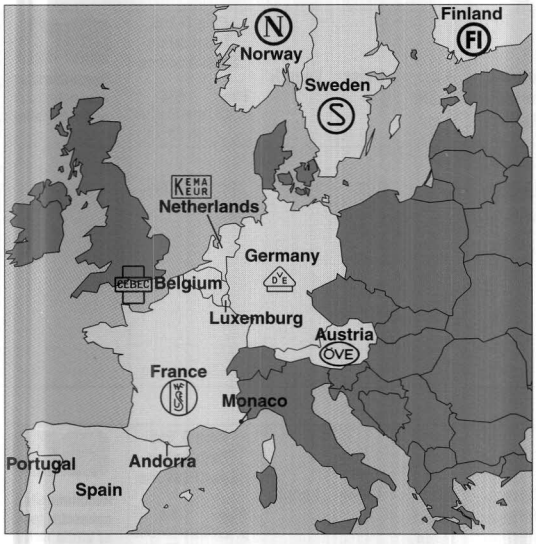
Fax toll-free: (800) 645-5360



Continental Europe

The CEE 7/7 ("Schuko") plug is used as a standard in Germany, Austria, Norway, Sweden, Finland, the Netherlands, Belgium, and France; it is also used in Portugal and Spain. (See page 15 for an explanation of CEE 7/4 and 7/7 plugs used in Europe.) A variation of the CEE 7/4 plug with 4mm contacts is used in Eastern European countries and in some Soviet republics. Variations of the CEE 7 plug are also used in Northern Africa, the Middle East, and Brazil; see the beginning of this section for more information.

Panel Components Corporation's Continental European cords utilize harmonized HD-21 ("HAR") cordage and carry all major European approvals as indicated by each part. Connector end drawings and approvals are shown on pages 72-73. None of these Continental European plugs are polarized. They can be wired either way.

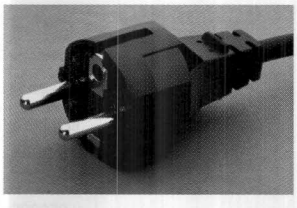
Note: The Continental European plug will fit 10A sockets in Italy and Denmark. However, the Continental European plug will not be grounded. We recommend the use of the plug shown on page 35 for Denmark, and page 44 for Italy.

Note: Sweden does not allow the use of rewireable plugs for medical use.

CONTINENTAL EUROPE PLUG SPECIFICATIONS

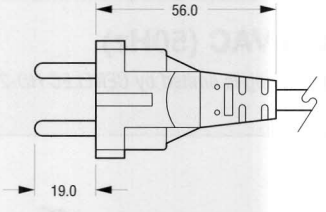
Standard: CEE 7/7
Material: PVC
Plug approvals appear below

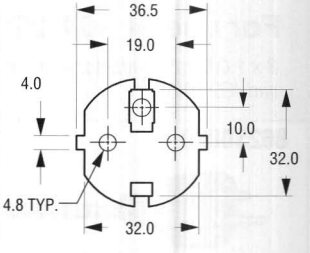
FACE VIEW

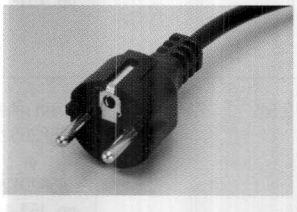


PA1

Country	Agency
Austria	OVE
Belgium	CEBEC
Finland	FIMKO
France	LCIE
Germany	VDE
Netherlands	KEMA
Norway	NEMKO
Sweden	SEMKO

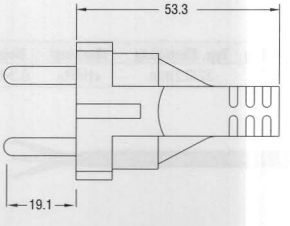






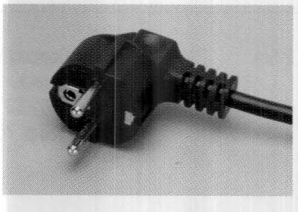
PA5

Country	Agency
Austria	OVE
Belgium	CEBEC
Finland	FIMKO
France	LCIE
Germany	VDE
Netherlands	KEMA
Norway	NEMKO
Sweden	SEMKO
Italy	IMQ
Denmark	DEMKO



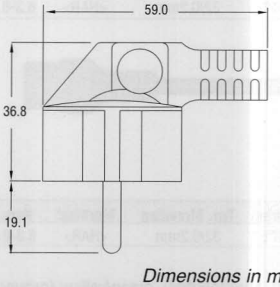
POLARIZATION

Note: The German mains are not polarized; grounding is achieved via grounding clips on the sides of the socket and plug. (Only the IEC 60320* connector of a cord-set is polarized.)



PA4

Country	Agency
Austria	OVE
Belgium	CEBEC
Finland	FIMKO
France	LCIE
Germany	VDE
Netherlands	KEMA
Norway	NEMKO
Sweden	SEMKO
Italy	IMQ
Denmark	DEMKO



Dimensions in mm

MATING SOCKETS

Part number	See page
88010300	91
88010310	91
88010610	91
88010500	90
88010200	91
Socket strips	232-233
Int'l Power Source	239
Int'l Socket Strips	230-231

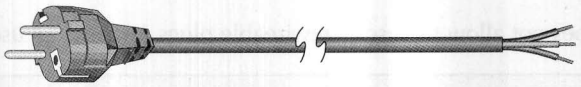
* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

For use at 6A/220-230VAC (50Hz)

3 x 0.75mm² conductor size – current rating is limited by CENELEC HD-21.

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 23	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
	6A/250 VAC	70°C	BLK	2.5m	PA5	TJ3	Strain reliefs, 85820520 or 85820120 pp. 151-152

86230010



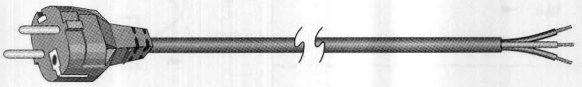
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	H05VVF3G0.75	INT'L*	24/0.2mm	<HAR>	6.0-7.6mm

For use at 10A/220-230VAC (50Hz)

*3 x 1.00mm² conductor size – current rating is limited by CENELEC HD-21 and IEC 60320***

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 23	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
	10A/250 VAC	70°C	BLK	2.5m	PA5	TJ3	Strain reliefs, 85820520 or 85820120 pp. 151-152

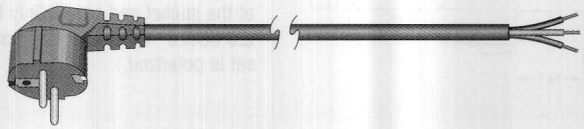
86230020



CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	6.3-8.0mm

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 23	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
	10A/250 VAC	70°C	BLK	2.5m	PA4	TJ3	Strain reliefs, 85820520 or 85820120 pp. 151-152

86230040



CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	6.3-8.0mm

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 23	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
	10A/250 VAC	70°C	BLK	2.5m	PA4	T02	Connector lock, 85910071 see p. 70

86230050

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	6.3-8.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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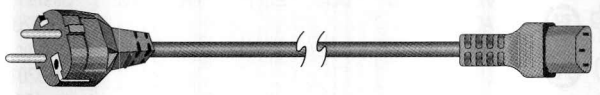
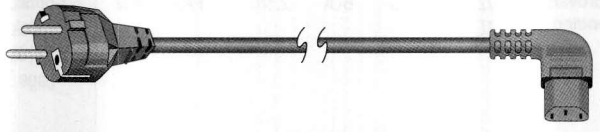
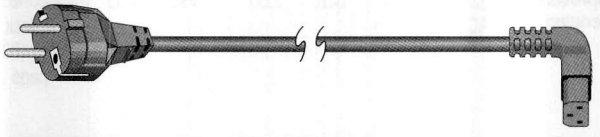
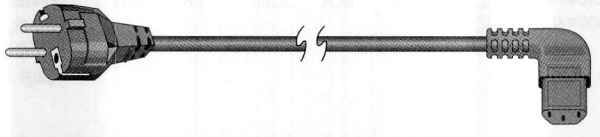
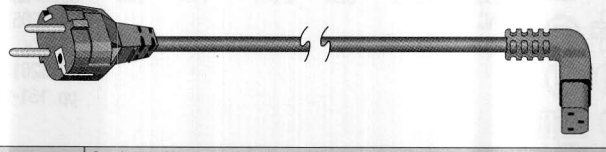
Fax toll-free: (800) 645-5360

For use at 10A/220-230VAC (50Hz) *3 x 1.00mm² conductor size – current rating is limited by IEC 60320***	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 23	 End Termination p. 72-73	Recommended connector lock or strain relief
86230110 		10A/250 VAC	70°C	BLK	2.5m	PA5	T02	Connector lock, 85910071 see p. 70
86230060 		10A/250 VAC	70°C	BLK	2.5m	PA5	T03	Connector lock, 85910071 see p. 70
86230070 		10A/250 VAC	70°C	BLK	2.5m	PA5	T05	Connector lock, 85910071 see p. 70
86230080 		10A/250 VAC	70°C	BLK	2.5m	PA5	T06	Connector lock, 85910071 see p. 70
86230090 		10A/250 VAC	70°C	BLK	2.5m	PA5	T07	Connector lock, 85910071 see p. 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	6.3-8.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

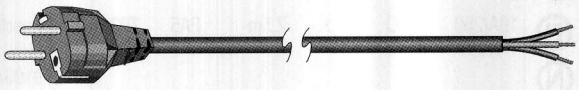
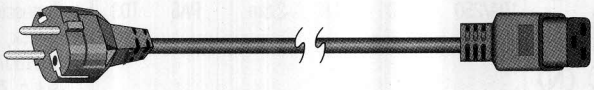
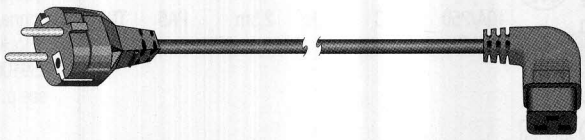
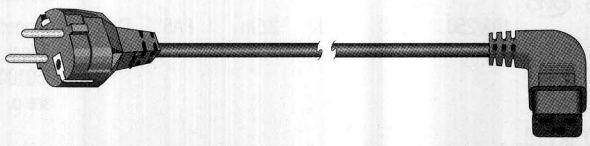
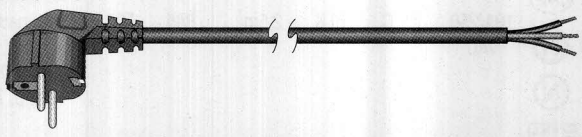
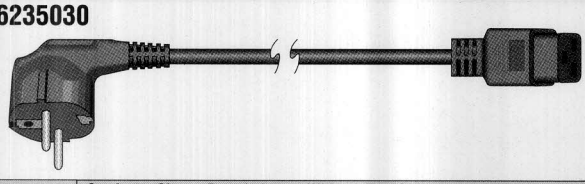
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Continental Europe, cont.

For use at 16A/220-230VAC (50Hz)

*3 x 1.50mm² conductor size – current rating is limited by to CENELEC HD-21 and IEC 60320***

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 23	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86230100 		16A/250 VAC	70°C	BLK	2.5m	PA5	TJ3	Strain reliefs 85820530 or 85820130, pp. 151-152
86235000 	Approvals Pending	16A/250 VAC	70°C	BLK	2.5m	PA5	X02	Connector lock, 85910051 page 70
86235020 	Approvals Pending	16A/250 VAC	70°C	BLK	2.5m	PA5	X03	Connector lock, 85910051 page 70
86235010 	Approvals Pending	16A/250 VAC	70°C	BLK	2.5m	PA5	X06	Connector lock, 85910051 page 70
86230120 		16A/250 VAC	70°C	BLK	2.5m	PA4	TJ3	Strain reliefs, 85820530 or 85820130 pp. 151-152
86235030 	Approvals Pending	16A/250 VAC	70°C	BLK	2.5m	PA4	X02	Connector lock, 85910051 page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.50mm²	H05VVF3G1.5	INT'L*	30/0.25mm	<HAR>	7.4-9.4mm

Note: Other assemblies available (Handmade/Custom Order). See page 75-86 for samples of options available with the Schuko plug.

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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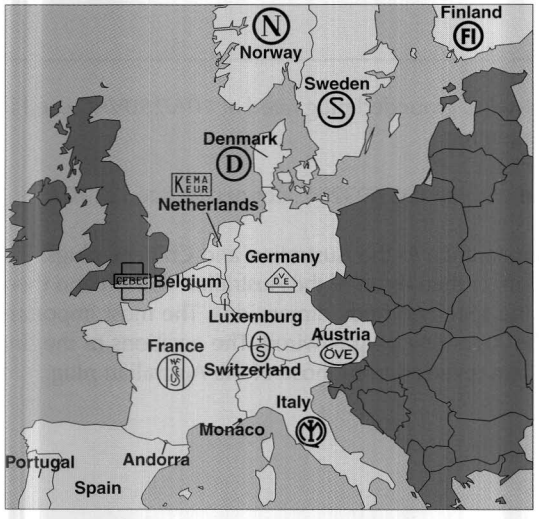


Europlug Cord & Cordset (2.5A)

The Europlug is a 2-wire, ungrounded CEE 7/16 plug rated at 2.5A/250VAC used in Class II applications throughout continental Europe (Germany, Austria, Switzerland, Italy, the Netherlands, Belgium, France, Spain, Portugal, Denmark, Norway, Sweden, Finland). It is also used in Greece, Turkey, the Middle East, most of Africa and South America, as well as Poland, The Czech Republic, Slovakia, Hungary, Rumania, Bulgaria, the Soviet republics, and many developing nations.

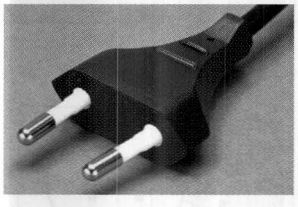
The cordset is terminated with an IEC 60320* connector rated at 2.5A.

The Europlug cord and cordset below are designed for high-volume, end-consumer applications. If your application is above 2.5A, you should specify a Continental European cord or cordset (pages 23-26).

EUROPLUG SPECIFICATIONS

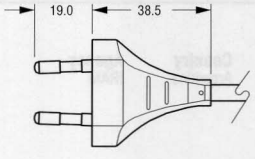
Standard: CEE 7/16
Material: PVC
Plug approvals appear below

FACE VIEW
Europlug is unpolarized

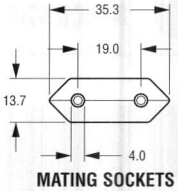


PB3

Country	Agency
Austria	OVE
Belgium	CEBEC
Denmark	DEMKO
Finland	FIMKO
France	LCIE
Germany	VDE
Netherlands	KEMA
Norway	NEMKO
Switzerland	SEV
Italy	IMQ
Sweden	SEMKO



Dimensions in mm

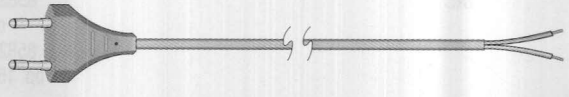


MATING SOCKETS

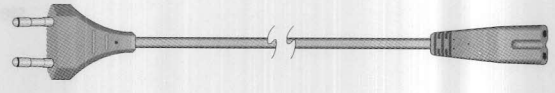
Part number	See page
88010300—Cont. Eur.	91
88010310—Cont. Eur.	91
88010610—Cont. Eur.	91
88010500—Cont. Eur.	90
88010200—Cont. Eur.	91
88010541—Denmark	95
88010580—Israel	96
88010572—Italy	97
88010330—Switzerland	112
88010530—Switzerland	112

For use at 2.5A/220-230VAC (50Hz)

*2 x 0.75mm² conductor size – current rating is limited by CEE 7/16 or IEC 60320**

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 27	End Termination p. 72-73	Recommended connector lock or strain relief
86532032 	OVE, FI, N, KEMA, S, Y	2.5A/250 VAC	70°C	BLK	1.8m	PB3	TJ5	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	2x0.75mm²	H03VVH2-F0.75	INT'L**	24/0.2mm	<HAR>	flat

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 27	End Termination p. 72-73	Recommended connector lock or strain relief
86532100 Cordset with C7 connector 	OVE, FI, N, KEMA, S, Y	2.5A/250 VAC	70°C	BLK	1.8m	PB3	TD1	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	2x0.75mm²	H05VVH2-F0.75	INT'L**	24/0.2mm	<HAR>	Flat

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

**Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International Harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

Argentina

The Argentine plug is a 3-wire, grounded plug rated at 10A/250VAC used in Class I applications in Argentina.

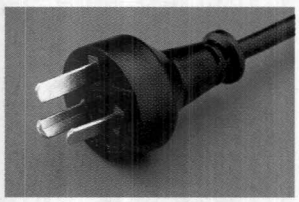
The cordset is terminated with an IEC 60320** connector rated at 10A.

This plug is similar in appearance to the Australian and Chinese plugs. The pins are one millimeter longer than those of the Australian version and there are slight differences in the specified body dimensions. The most important difference lies in how the Argentine plug is wired. The positions of the line and neutral contact pins are reversed from those of the Australian plug.

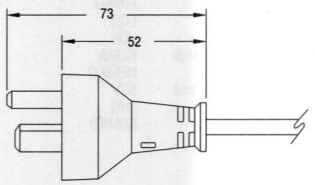
ARGENTINA SPECIFICATIONS

Standard: IRSM 2073:1982
Material: PVC
Plug approvals appear below

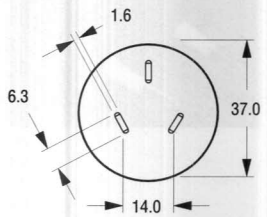
FACE VIEW

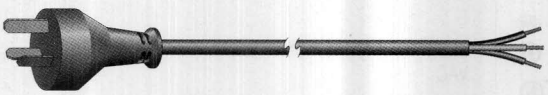
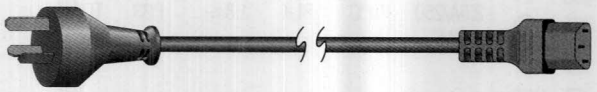


PT1 **Country** Argentina **Agency** IRAM



Dimensions in mm



For use at 10A/220VAC (50Hz) *3 x 1.00mm² conductor size*	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 28	End Termination p. 72-73	Recommended connector lock or strain relief
86517020 		10A/250 VAC	70°C	BLK	2.5m	PT1	TJ3	Strain reliefs 85820520 or 85820120 pp. 151-152
86390010 		10A/250 VAC	70°C	BLK	2.5m	PT1	T02	Connector Lock 85910071 see p. 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.
** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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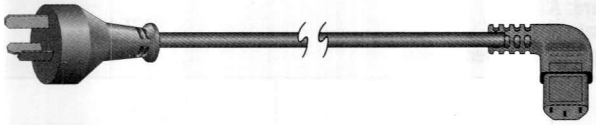
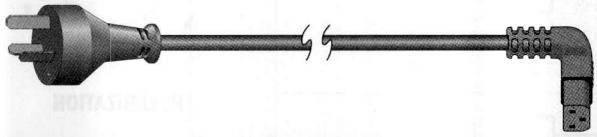
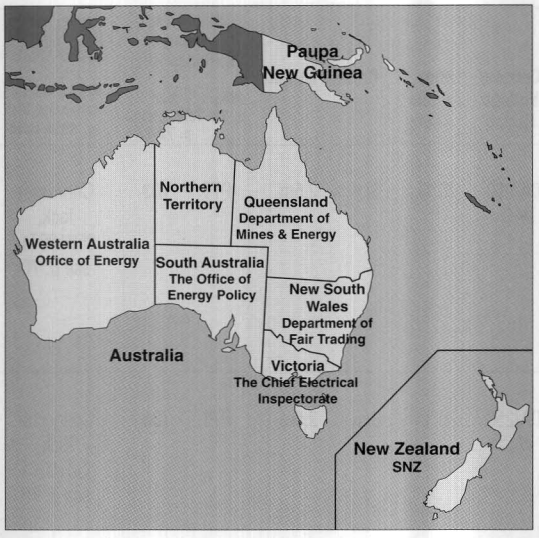
							VAC					lock, 85910071, see p. 70
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.						
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm						
86390040												
							10A/250 VAC	70°C	BLK	2.5m	PT1 T06	Connector lock, 85910071, see p. 70
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.						
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm						
86390050												
							10A/250 VAC	70°C	BLK	2.5m	PT1 T07	Connector lock, 85910071, see p. 70
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.						
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm						

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.



Australia/New Zealand

The 10 amp Australian plug (AS 3112) is used in Australia, New Zealand, Fiji, and Papua New Guinea.

Australia has several state electrical testing agencies; a component approved at one of the agencies is usually accepted by the others. The Australian agencies also accept component approvals from SNZ, the New Zealand electrical testing agency, and vice versa.

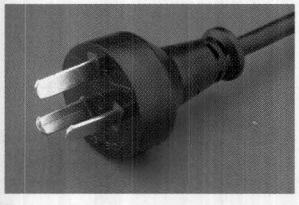
A cordset with clear plug (see model 86516080 page 31) is recommended for use on medical equipment in Australia.

Please note that all of the Australian agencies listed on the left have changed their name recently.

AUSTRALIAN PLUG SPECIFICATIONS

Standard: AS 3112
Material: PVC
Plug approvals appear below

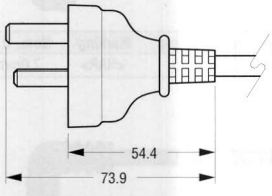
FACE VIEW

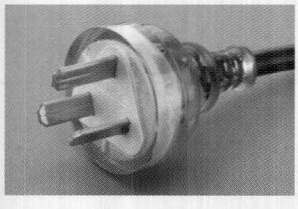


PC1

Country Australia

Agency Department of Fair Trading

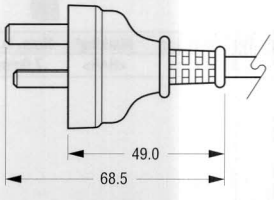


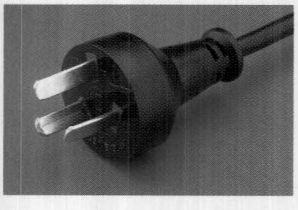


PC2

Country Australia

Agency Office of the Chief Electrical Inspectorate

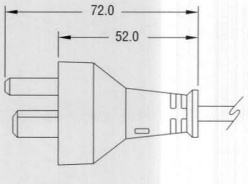


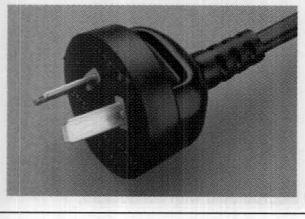


PC3

Country Australia

Agency Office of the Chief Electrical Inspectorate

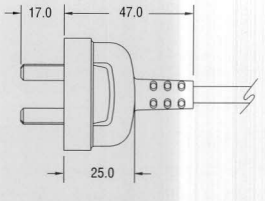


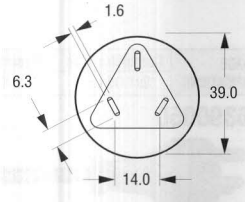


PP1

Country Australia

Agency Department of mines and Energy

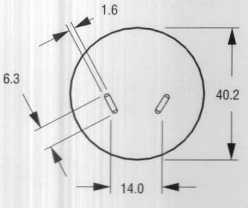




POLARIZATION

MATING SOCKETS

Part number	See page
88010512	93
88010411	93
Socket Strip	234
Int'l Socket Strips	230-231



Dimensions in mm

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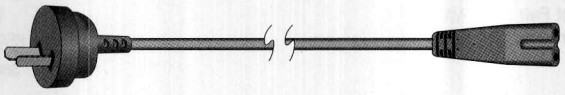
For use at 2.5A/240VAC (50Hz)

*86557120: 3x0.75mm² conductors, 86557120: 2x0.75mm² conductors — current ratings are limited by IEC 60320***

	Approvals	Current/ Voltage Rating	Max. Cable Temp	Color	Length	Plug & End Termination Specifications: Plug p. 30	End Termination p. 72-73	Recommended connector lock or strain relief
86557120 Cordset with C5 connector	Office of the Chief Electrical Inspectorate	2.5A/250 VAC	70°C	BLK	1.8m	PC3	TH1	—

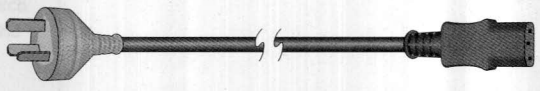
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	H03VVF3F0.75	INT'L*	24/0.2mm	<HAR>	5.8mm

	Approvals	Current/ Voltage Rating	Max. Cable Temp	Color	Length	Plug p. 30	End Termination p. 72-73	Recommended connector lock or strain relief
86532110 Cordset with C7 connector 	Department of Mines & Energy EANSW Department of Fair Trading	2.5A/250 VAC	70°C	BLK	1.8m	PP1	TD1	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	2x0.75mm²	H03VVH2G0.75	INT'L*	24/0.2mm	<HAR>	Flat

For use at 10A/240VAC (50Hz)

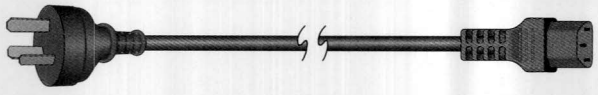
3 x 1.00mm² conductors – current rating according to AS 3191 and AS 3112.

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 30	End Termination p. 72-73	Recommended connector lock or strain relief
86516080 **Plug is clear for use in medical applications** 	Department of Fair Trading	10A/250 VAC	75°C	BLK/ Clear Plug	2.5m	PC2	TC3	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.00	INT'L*	32/0.2mm	V76419	7.0mm

	Approvals	Current/ Voltage Rating	Max. Cable Temp	Color	Length	Plug p. 30	End Termination p. 72-73	Recommended connector lock or strain relief
86210020	Department of Fair Trading	10A/250 VAC	70°C	BLK	2.5m	PC4	TJ3	Strain reliefs, 85820520 or 85820120 pp. 151-152

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.00	INT'L*	32/0.2mm	<HAR>	6.3-8.0mm

	Approvals	Current/ Voltage Rating	Max. Cable Temp	Color	Length	Plug p. 30	End Termination p. 72-73	Recommended connector lock or strain relief
86210030 	Department of Fair Trading	10A/250 VAC	70°C	BLK	2.5m	PC4	T02	Connector lock, 85910071, see p. 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.00	INT'L*	32/0.2mm	<HAR>	6.3-8.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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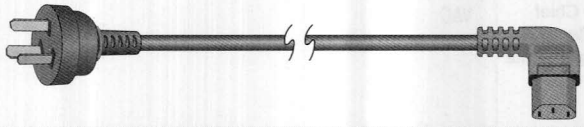
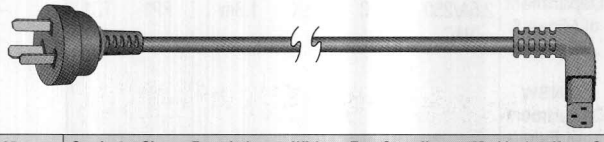
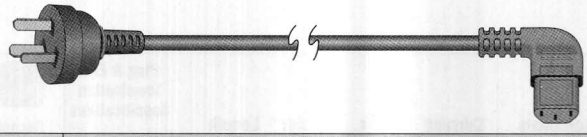
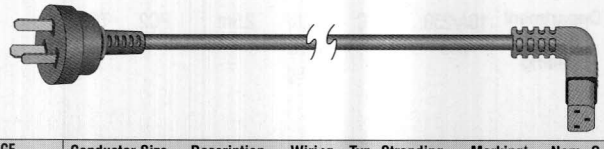
Fax toll-free: (800) 645-5360

For use at 10A/240VAC (50Hz) *3 x 1.00mm² conductors – current rating is limited by AS 3191 and AS 3112.*	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 30	 End Termination p. 72-73	Recommended connector lock or strain relief
86210040  CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.00 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 6.3-8.0mm	Department of Fair Trading	10A/250 VAC	70°C	BLK	2.5m	PC4	T03	Connector lock, 85910071, see p. 70
86210050  CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.00 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 6.3-8.0mm	Department of Fair Trading	10A/250 VAC	70°C	BLK	2.5m	PC4	T05	Connector lock, 85910071, see p. 70
86210060  CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.00 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 6.3-8.0mm	Department of Fair Trading	10A/250 VAC	70°C	BLK	2.5m	PC4	T06	Connector lock, 85910071, see p. 70
86210070  CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.00 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 6.3-8.0mm	Department of Fair Trading	10A/250 VAC	70°C	BLK	2.5m	PC4	T07	Connector lock, 85910071, see p. 70

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

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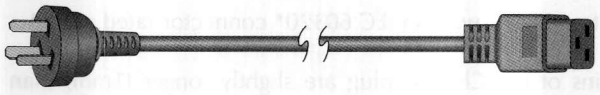
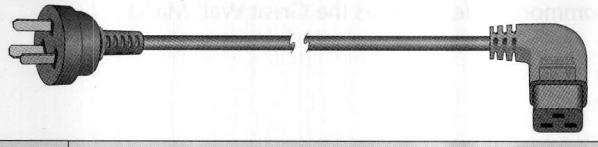
Fax toll-free: (800) 645-5360

For use at 10A/240VAC (50Hz)

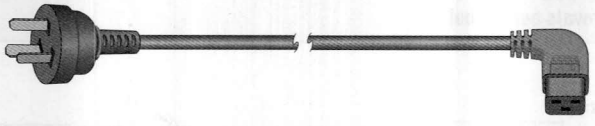
3 x 1.50mm² conductor size – current rating limited by CENELEC HD-21.

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 30	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86210080 	Approvals Pending	10A/250 VAC	70°C	BLK	2.5m	PC4	X02	Connector lock, 85910051 page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.50mm²	H05VVF3G1.5	INT'L*	30/0.25mm	<HAR>	7.4-9.4mm

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 30	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86215020 	Approvals Pending	10A/250 VAC	70°C	BLK	2.5m	PC4	X03	Connector lock, 85910051 page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.50mm²	H05VVF3G1.5	INT'L*	30/0.25mm	<HAR>	7.4-9.4mm

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 30	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86215010 	Approvals Pending	10A/250 VAC	70°C	BLK	2.5m	PC4	X06	Connector lock, 85910051 page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.50mm²	H05VVF3G1.5	INT'L*	30/0.25mm	<HAR>	7.4-9.4mm

Note: Other assemblies available (Handmade/Custom Order). See page 75-86 for samples of options available with the Australian plug.

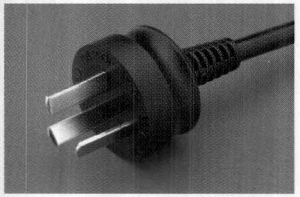
* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

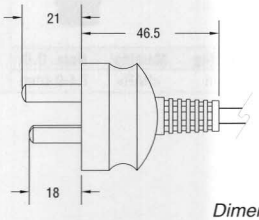
CHINA SPECIFICATIONS

Standard: GB 2099.1-1996 and GB 1002-1996
Materials: PVC
Plug approvals appear below

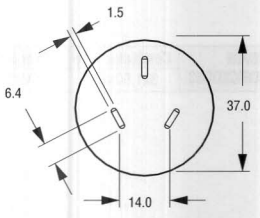
FACE VIEW



PX1 **Country** China **Agency** CCEE

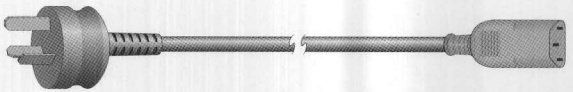
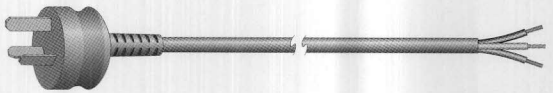


Dimensions in mm



For use at 10A/220VAC (50Hz)

3 x 1.00mm² conductor size

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 34	End Termination p. 72-73	Recommended connector lock or strain relief
86517040 	CCEE	10A/250 VAC	70°C	BLK	2.5m	PX1	—	—
86517050 	CCEE	10A/250 VAC	70°C	BLK	2.5m	PX1	TJ4	Strain Relief 85820520 or 85820120 pp. 151-152

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	RVV	INT'L**	32/0.2mm	—	7.1mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

**Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International Harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

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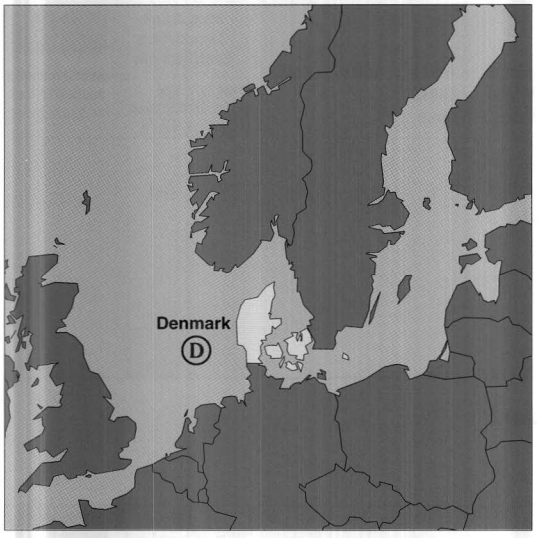


Denmark

The standard Danish plug is described in DEMKO publication Afsnit 107-2-D1. The Danish plug has a pin pattern similar to the standard Schuko CEE 7/7 plug, but grounding is achieved by use of a short ground pin. Note that although the standard Schuko CEE 7/7 plug fits the Danish socket, it will not be grounded, which may result in serious safety hazards and liability exposure for the manufacturer. For this reason, it is important to use a Danish plug on equipment being sent to Denmark.

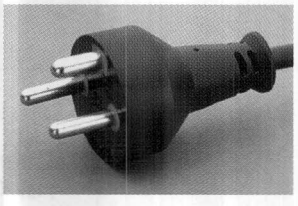
Data Circuits: A plug and socket standard has been developed for use in computer circuits that are especially sensitive to power line spikes and surges; Panel Components Corporation's cordset 86536060 utilizes the data plug. A mating power outlet (not stocked) accepts the data equipment plug, but not the standard Danish plug.

Note: *For safety reasons, it is important to use a cord or cordset with the Danish plug when shipping equipment to Denmark.*

DENMARK PLUG SPECIFICATIONS

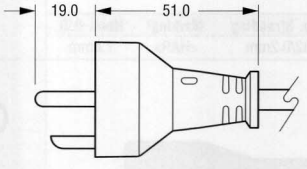
Standard: Afsnit 107-2-D1
Material: PVC
Plug approvals appear below

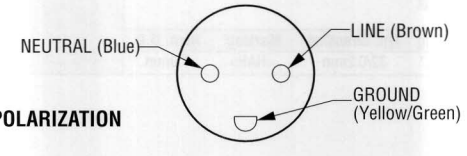
FACE VIEW



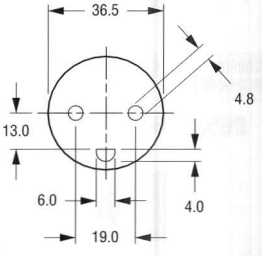
PE1

Country	Agency
Denmark	DEMKO



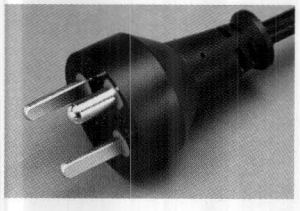


POLARIZATION



MATING SOCKETS

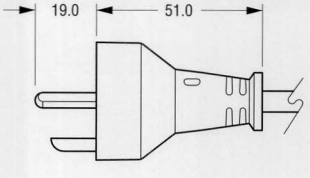
Part number	See page
88010541	95
Int'l Socket Strips	230-231

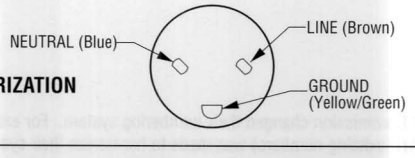


PE2

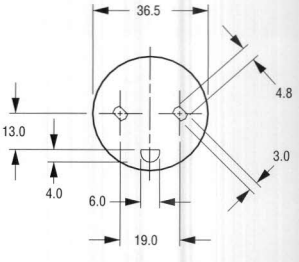
Danish Data Circuit Plug

Country	Agency
Denmark	DEMKO





POLARIZATION



Dimensions in mm

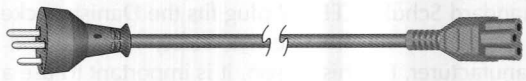
Denmark, cont.

For use at 2.5A/230VAC (50Hz)

3 x 0.75mm² conductor size – current rating is limited by IEC 60320 sheet C7 connector.*

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 35	End Termination p. 72-73	Recommended connector lock or strain relief
Ⓓ	2.5A/250 VAC	70°C	BLK	1.8m	PE1	TH1	—

86557160 Cordset with C5 connector



CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	H03VVF3G0.75	INT'L**	24/0.2mm	<HAR>	5.8mm

Note: For a Danish Class II cordset with an IEC 60320* sheet C7 connector, see the Eurocord (86532100 on page 27.)

For use at 10A/230VAC (50Hz)

3 x 1.00mm² conductors

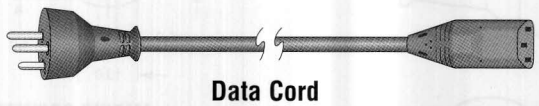
Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 35	End Termination p. 72-73	Recommended connector lock or strain relief
Ⓓ	10A/250 VAC	70°C	BLK	2.5m	PE1	TJ1	Strain reliefs, 85820520 or 85820120 pp. 151-152

86539030

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 35	End Termination p. 72-73	Recommended connector lock or strain relief
Ⓓ	10A/250 VAC	70°C	BLK	2.5m	PE2	TC1	Connector lock, 85910010, page 70

86536060



Data Cord

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

**Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International Harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

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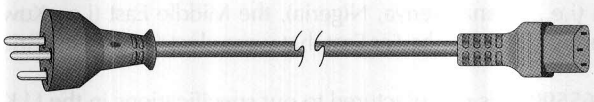
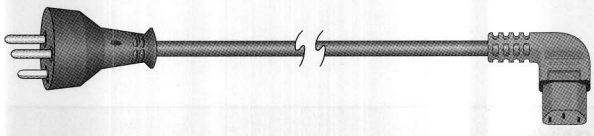
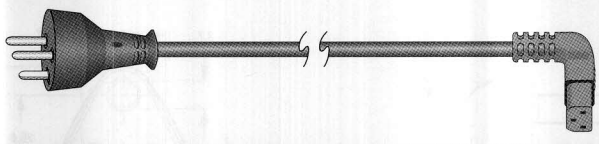
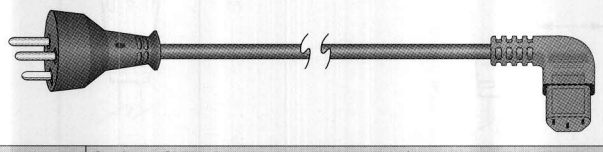
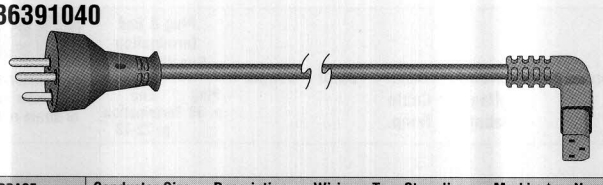
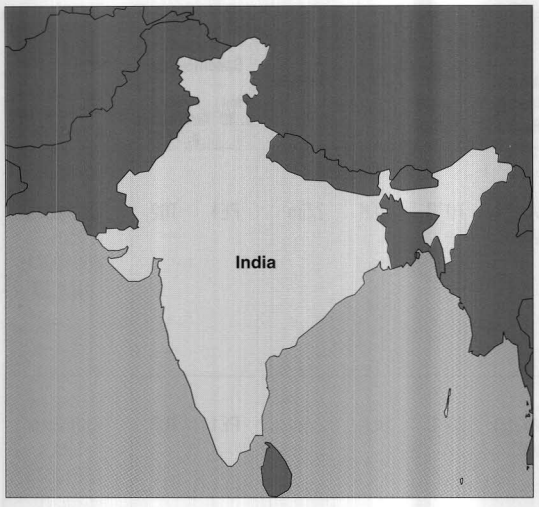
For use at 10A/220-230VAC (50Hz) *3 x 1.00mm² conductor size*	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 35	 End Termination p. 72-73	Recommended connector lock or strain relief
86391000 	Ⓓ	10A/250 VAC	70°C	BLK	2.5m	PE1	T02	Connector lock, 85910071 page 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L** · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 7.0mm								
86391010 	Ⓓ	10A/250 VAC	70°C	BLK	2.5m	PE1	T03	Connector lock, 85910071 page 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L** · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 7.0mm								
86391020 	Ⓓ	10A/250 VAC	70°C	BLK	2.5m	PE1	T05	Connector lock, 85910071 page 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L** · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 7.0mm								
86391030 	Ⓓ	10A/250 VAC	70°C	BLK	2.5m	PE1	T06	Connector lock, 85910071 page 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L** · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 7.0mm								
86391040 	Ⓓ	10A/250 VAC	70°C	BLK	2.5m	PE1	T07	Connector lock, 85910071 page 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L** · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 7.0mm								

**Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International Harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.



India/South Africa

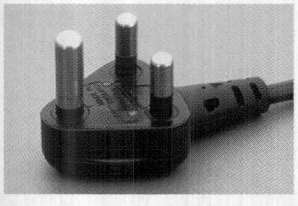
The plug standard used most extensively in India and South Africa is the old British standard, BS 546. (This plug standard is being phased out of use in the U.K. and replaced by BS 1363.) The BS 546 standard is also used in parts of Africa (i.e., Ghana, Kenya, Nigeria), the Middle East (i.e., Kuwait, Qatar), and parts of Asia and the Far East that were electrified by the British.

Cord model 86559011 is manufactured to our specifications in the U.K. It meets British standards, but carries no approvals. No approvals are required in the countries where it is used.

INDIA/SOUTH AFRICA PLUG SPECIFICATIONS

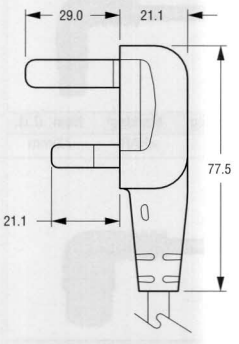
Standard: None required
Material: PVC
Plug approvals appear below

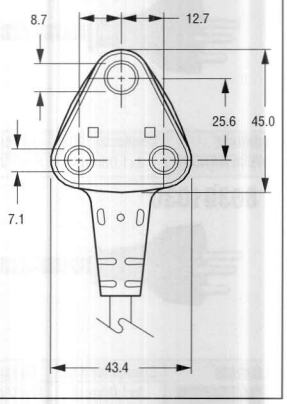
FACE VIEW



PG1

Country	Approvals
India/ South Africa	none required





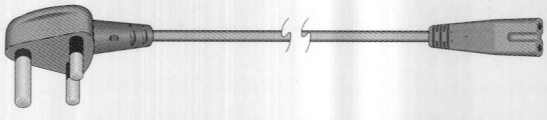
Dimensions in mm

MATING SOCKETS

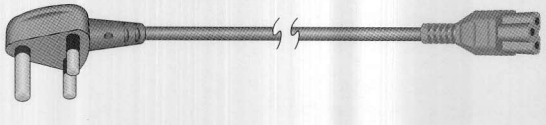
Part number	See page
88010561	96
Int'l Socket Strips	230-231

For use at 2.5A/220-250VAC (50Hz)

*2 or 3 x 0.75mm² conductor size – current rating limited by IEC 60320** connector.*

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 38	End Termination p. 72-73	Recommended connector lock or strain relief
86532130 Cordset with C7 connector 	None required	2.5A/250 VAC	70°C	BLK	1.8m	PG1	TD1	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	2x0.75mm²	H05VVH2-F0.75	INT'L*	7/0.37mm	<HAR>	flat

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug p. 38	End Termination p. 72-73	Recommended connector lock or strain relief
86557150 Cordset with C5 connector 	None required	2.5A/250 VAC	70°C	BLK	1.8m	PG1	TH1	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	H03VVF3G0.75	INT'L*	24/0.2mm	<HAR>	5.8mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.
** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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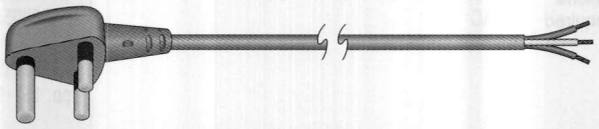
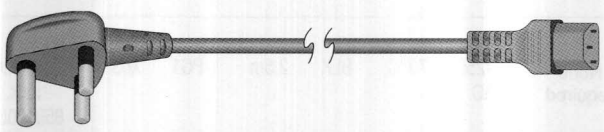
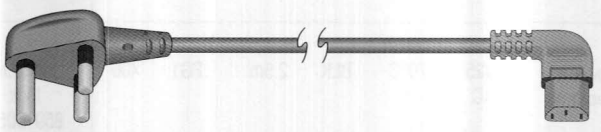
For use at 10A/220-250VAC (50Hz) *3 x 1.00mm² conductor size — current rating is limited by CENELEC HD-21*	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 38	 End Termination p. 72-73	Recommended connector lock or strain relief
86559020 	None required	10A/250 VAC	70°C	BLK	2.5m	PG1	TJ3	Strain Relief 85820520 or 85820120 pp. 151-152

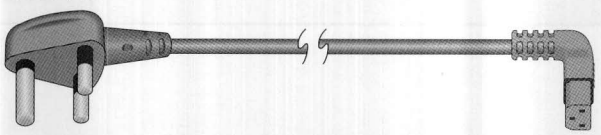
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

For use at 10A/220-250VAC (50Hz) *3 x 1.00mm² conductor size —current rating is limited by CEMELEC HD-21 and IEC 60320***	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 38	 End Termination p. 72-73	Recommended connector lock or strain relief
86392000 	None required	10A/250 VAC	70°C	BLK	2.5m	PG1	T02	Connector lock, 85910071, page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

86392010 	None required	10A/250 VAC	70°C	BLK	2.5m	PG1	T03	Connector lock, 85910071, page 70

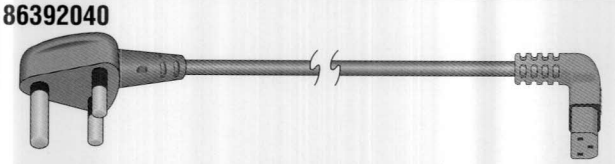
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

86392020 	None required	10A/250 VAC	70°C	BLK	2.5m	PG1	T05	Connector lock, 85910071, page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

86392030 	None required	10A/250 VAC	70°C	BLK	2.5m	PG1	T06	Connector lock, 85910071, page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

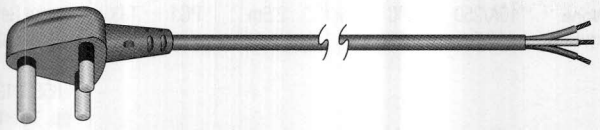
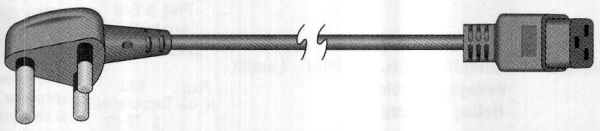
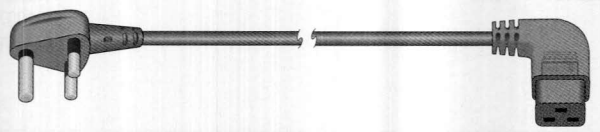
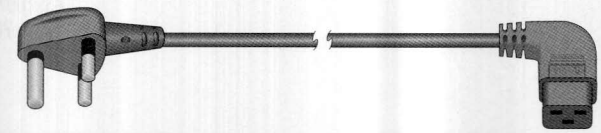
86392040 	None required	10A/250 VAC	70°C	BLK	2.5m	PG1	T07	Connector lock, 85910071, page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

For use at 15A/220-250VAC (50Hz) 3 x 1.50mm² conductor size — current rating is limited by IEC 60320**	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 38	 End Termination p. 72-73	Recommended connector lock or strain relief
86559030 	None required	15A/250 VAC	70°C	BLK	2.5m	PG1	TJ3	Strain Relief 85820530 or 85820130 pp. 151-152
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.50mm² · Description: H05VVF3G1.5 · Wiring: INT'L* · Typ. Stranding: 29/0.25mm · Marking†: <HAR> · Nom. O.D.: 8.5mm								
86395000 	None required	15A/250 VAC	70°C	BLK	2.5m	PG1	X02	Connector lock, 85910051 page 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.50mm² · Description: H05VVF3G1.5 · Wiring: INT'L* · Typ. Stranding: 29/0.25mm · Marking†: <HAR> · Nom. O.D.: 8.5mm								
86395020 	None required	15A/250 VAC	70°C	BLK	2.5m	PG1	X03	Connector lock, 85910051 page 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.50mm² · Description: H05VVF3G1.5 · Wiring: INT'L* · Typ. Stranding: 29/0.25mm · Marking†: <HAR> · Nom. O.D.: 8.5mm								
86395010 	None required	15A/250 VAC	70°C	BLK	2.5m	PG1	X06	Connector lock, 85910051 page 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.50mm² · Description: H05VVF3G1.5 · Wiring: INT'L* · Typ. Stranding: 29/0.25mm · Marking†: <HAR> · Nom. O.D.: 8.5mm								

Note: Other assemblies available (Handmade/Custom Order). See page 75-86 for samples of options available with the Indian/South African plug.

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.
** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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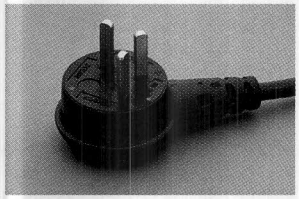
ISRAEL PLUG SPECIFICATIONS

Standard: SI-32
Materials: PVC
Plug approvals appear below

FACE VIEW

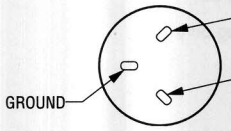


MATING SOCKET

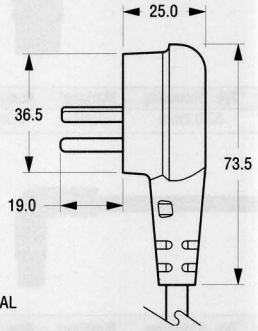
Part number	See page
88010580	96

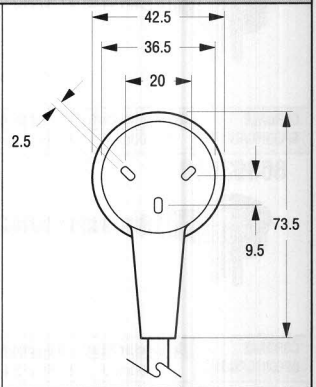
PH1

Country	Agency
Israel	SII



POLARIZATION





Dimensions in mm

For use at 2.5A/230VAC (50Hz)

3 x 0.75mm² conductor size – current rating according to CENELEC HD-21.

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications... Plug	Plug & End Termination Specifications... End Termination	Recommended connector lock or strain relief
					p. 41	p. 72-73	
Plug only	2.5A/250 VAC	70°C	BLK	1.8m	PH1	TH1	—

86557190 Cordset with C5 connector

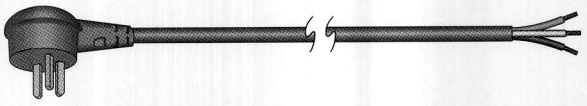
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	H03VVF3G0.75	INT'L*	24/0.2m	<HAR>	5.8mm

Note: For an Israel Class II cordset with an IEC 60320* sheet C7 connector, see the Eurocord (86532100 on page 27.)

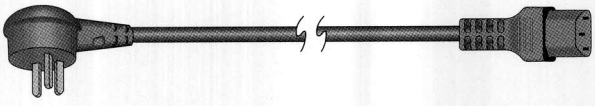
* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

For use at 10A/230VAC (50Hz)

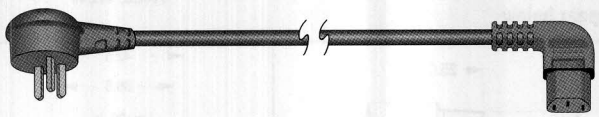
*3 x 1.00mm² conductor size — current rating limited by CENELEC HD-21 or IEC 60320***

	Approvals	Current/ Voltage Rating	Max. Cable Table	Color	Length	Plug & End Termination Specifications: Plug p. 41	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86558020 	Plug only	10A/250 VAC	70°C	BLK	2.5m	PH1	TJ3	Strain Relief 85820520 or 85820120, pp. 151-152

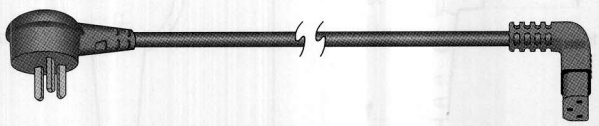
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

	Approvals	Current/ Voltage Rating	Max. Cable Table	Color	Length	Plug p. 41	End Termination p. 72-73	Recommended connector lock or strain relief
86393000 	Plug only	10A/250 VAC	70°C	BLK	2.5m	PA1	T02	Connector lock, 85910071, page 70

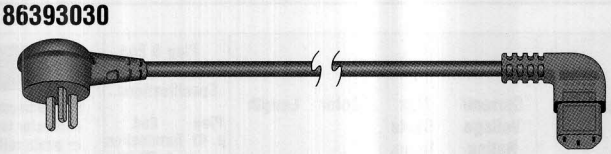
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

	Approvals	Current/ Voltage Rating	Max. Cable Table	Color	Length	Plug p. 41	End Termination p. 72-73	Recommended connector lock or strain relief
86393010 	Plug only	10A/250 VAC	70°C	BLK	2.5m	PA1	T03	Connector lock, 85910071, page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

	Approvals	Current/ Voltage Rating	Max. Cable Table	Color	Length	Plug p. 41	End Termination p. 72-73	Recommended connector lock or strain relief
86393020 	Plug only	10A/250 VAC	70°C	BLK	2.5m	PA1	T05	Connector lock, 85910071, page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

	Approvals	Current/ Voltage Rating	Max. Cable Table	Color	Length	Plug p. 41	End Termination p. 72-73	Recommended connector lock or strain relief
86393030 	Plug only	10A/250 VAC	70°C	BLK	2.5m	PA1	T06	Connector lock, 85910071, page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

	Approvals	Current/ Voltage Rating	Max. Cable Table	Color	Length	Plug p. 41	End Termination p. 72-73	Recommended connector lock or strain relief
86393040	Plug only	10A/250 VAC	70°C	BLK	2.5m	PA1	T07	Connector lock, 85910071, page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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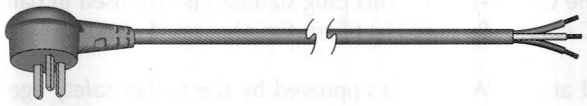
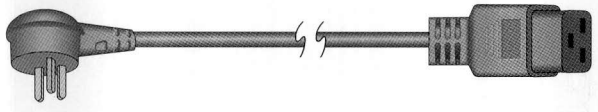
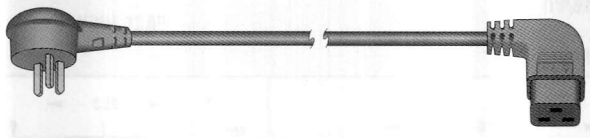
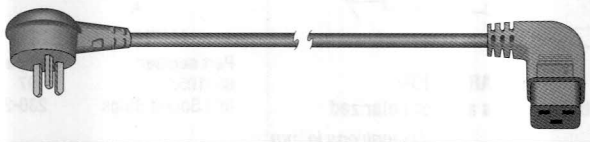
For use at 16A/230VAC (50Hz) 3 x 1.50mm² conductor size	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 41	 End Termination p. 72-73	Recommended connector lock or strain relief
86558030 	Plug only	16A/250 VAC	70°C	BLK	2.5m	PH1	TG1	Strain Relief 85820530 or 85820130 pp. 151-152
86395030 	Plug only	16A/250 VAC	70°C	BLK	2.5m	PH1	X02	Connector lock, 85910051 page 70
86395050 	Plug only	16A/250 VAC	70°C	BLK	2.5m	PH1	X03	Connector lock, 85910051 page 70
86395040 	Plug only	16A/250 VAC	70°C	BLK	2.5m	PH1	X06	Connector lock, 85910051 page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.50mm²	H05VVF3G1.5	INT'L*	29/0.25mm	<HAR>	8.5mm

Note: Other assemblies available (Handmade/Custom Order). See pages 75-86 for samples of options available with the Israel plug.

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

Italy (CEI 23-16/VII plug)

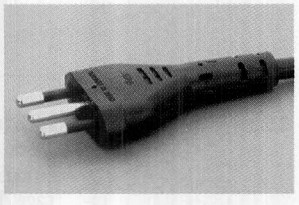
There are several types of plugs used in Italy (including the Continental European CEE 7/7 plug); however, the official standard is the one shown on the cord below, the CEI 23-16/VII. This plug standard is also used in parts of North Africa. PCC cordset 86531031 utilizes the plug rated at 10A.

This cord is rated at 250VAC and is approved by the Italian safety agency, IMQ.

ITALY PLUG SPECIFICATIONS

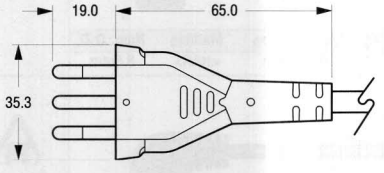
Standard: CEI 23-16/VII
Material: PVC
Plug approvals appear below

FACE VIEW



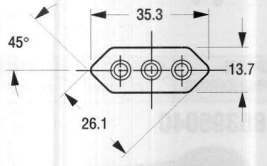
PI1

Country	Agency
Italy	IMQ



POLARIZATION
Italian mains are not polarized

Dimensions in mm



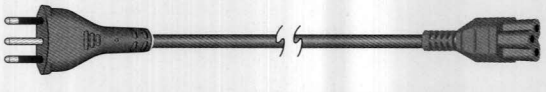
MATING SOCKETS

Part number	See page
88010572	97
Int'l Socket Strips	230-231

For use at 2.5A/230VAC (50Hz)

3 x 1.00mm² conductor size – current rating according to CENELEC HD-21.

86557180

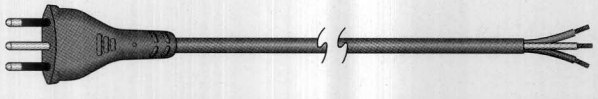


CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	H03VVF3G0.75	INT'L*	24/0.2mm	<HAR>	5.8mm

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 44	End Termination p. 72-73	Recommended connector lock or strain relief
	2.5A/250 VAC	70°C	BLK	1.8m	PI1	TH1	—

For use at 10A/230VAC (50Hz)

86531031



CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 44	End Termination p. 72-73	Recommended connector lock or strain relief
	10A/250 VAC	70°C	BLK	2.5m	PI1	TJ3	Strain Reliefs 85820520 or 85820120 pp. 151-152

Note: For an IEC 60320* sheet C7 connector used in Italy, see the Eurocord 86532100 on page 27.

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

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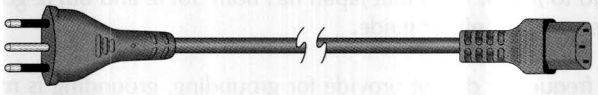
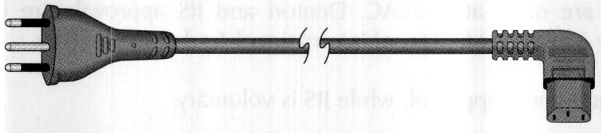
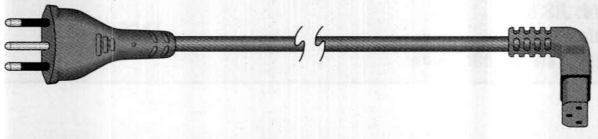
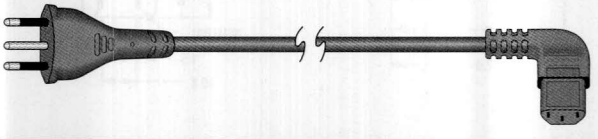
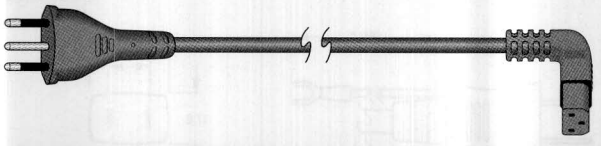
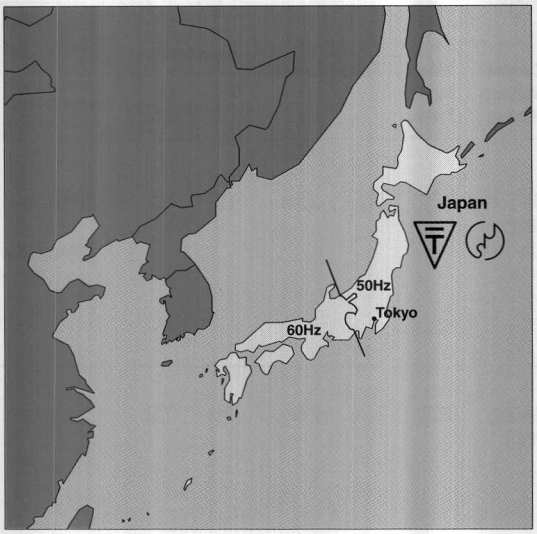
Fax toll-free: (800) 645-5360

For use at 10A/230VAC (50Hz) *3 x 1.00mm² conductor size*	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 44	 End Termination p. 72-73	Recommended connector lock or strain relief
86394000 		10A/250 VAC	70°C	BLK	2.5m	PI1	T02	Connector lock, 85910071 see p.70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86394010 		10A/250 VAC	70°C	BLK	2.5m	PI1	T03	Connector lock, 85910071 see p.70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86394020 		10A/250 VAC	70°C	BLK	2.5m	PI1	T05	Connector lock, 85910071 see p.70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86394030 		10A/250 VAC	70°C	BLK	2.5m	PI1	T06	Connector lock, 85910071 see p.70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86394040 		10A/250 VAC	70°C	BLK	2.5m	PI1	T07	Connector lock, 85910071 see p.70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								

Note: Other assemblies available (Handmade/Custom Order). See page 75-86 for samples of options available with the Indian/South African plug.

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.



Japan

The Japanese plug (and IEC 60320*-style connector) is specified in JIS 8303. Cordage meets JIS C3306. Dentori "T mark" approval is required on cords and cordsets exported to Japan. Note that Japan has both 50Hz and 60Hz generating systems; see map at left for guide.

Japanese mains frequently do not provide for grounding; grounding is made to the wall socket by use of an adapter. PCC stocks a 2-contact plug with integral grounding adapter, 86589030, below. Also see grounding adapter 88100011 on page 97 of the Plug & Socket section.

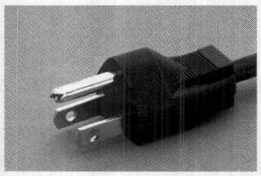
These cordsets are rated at 125VAC. Dentori and JIS approvals are both administered by MITI, the Ministry of International Trade and Industry.

Dentori is a requirement approval, while JIS is voluntary.

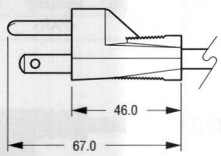
JAPAN PLUG SPECIFICATIONS

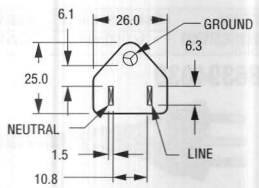
Standard: JIS 8303
Material: PVC
Plug approvals appear below

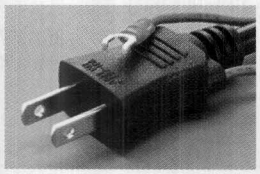
FACE VIEW



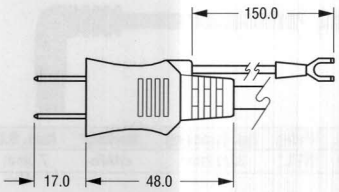
PJ1 | **Country**: Japan | **Agency**: Dentori

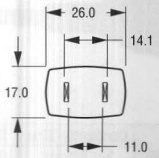


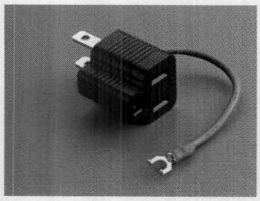




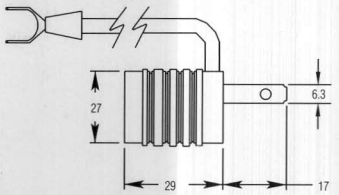
PJ2 | **Country**: Japan | **Agency**: Dentori JIS

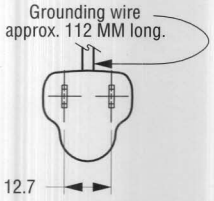






Country: Japan | **Agency**: Dentori





Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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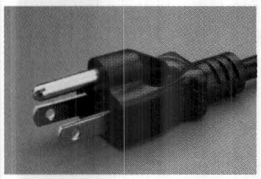
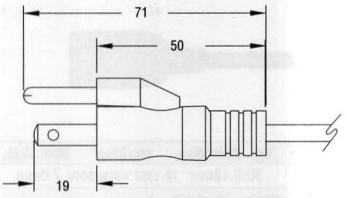
JAPAN PLUG SPECIFICATIONS

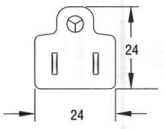
Standard: JIS 8303
Material: PVC
Plug approvals appear below

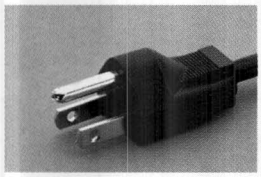
FACE VIEW



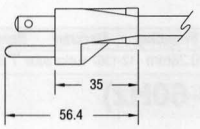
PJ3 **Country** Japan **Agency** Dentori

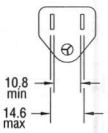


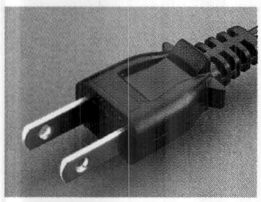




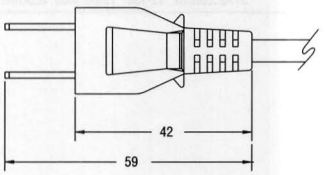
PJ4 **Country** Japan **Agency** Dentori







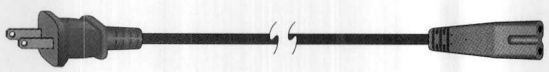
PM1 **Country** Japan **Agency** Dentori



Dimensions in mm

For use at 3A/100VAC (50-60Hz)

2 or 3 x 0.75mm² conductor size – current rating limited by IEC 60320** connector.

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 46 & 47	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86532140 		3A/125 VAC	70°C	BLK	1.8m	PM1	TD1	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	2x0.75mm²	H05VVH2-F0.75	INT'L*	7/0.37mm	<HAR>	flat

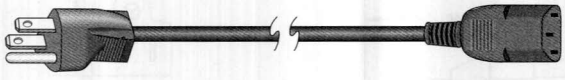
	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 46 & 47	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86557110		3A/125 VAC	70°C	BLK	1.8m	PJ3	TH1	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	VCTF	N.A.*	30/0.18mm	—	7.0mm

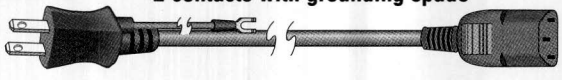
* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground) N.A.—North American: black (line), white (neutral), green (ground).
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Japan, cont.

For use at 7A/100VAC (50-60Hz)	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 46 & 47	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86589000 		7A/125 VAC	60°C	BLK	2.3m	PJ1	TC6	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	FT-VCTF	N.A.*	30/0.18mm	12-1367 Yukita 300V	7.0mm

For use at 12A/100VAC (50-60Hz)	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 46 & 47	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86589030 2 contacts with grounding spade 		12A/125 VAC	60°C	BLK	2.4m	PJ2	TC6	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.25mm²	VCTF	N.A.*	37/0.26mm	12-1367 Yukita 300V	7.8mm

For use at 15A/100VAC (50-60Hz)	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 46 & 47	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86589010		15A/125 VAC	60°C	BLK	2.4m	PJ4	TC7	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x2.00mm²	FT-VCTF	N.A.*	37/0.26mm	12-1367 Yukita 300V	8.5mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground) N.A.—North American: black (line), white (neutral), green (ground).
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

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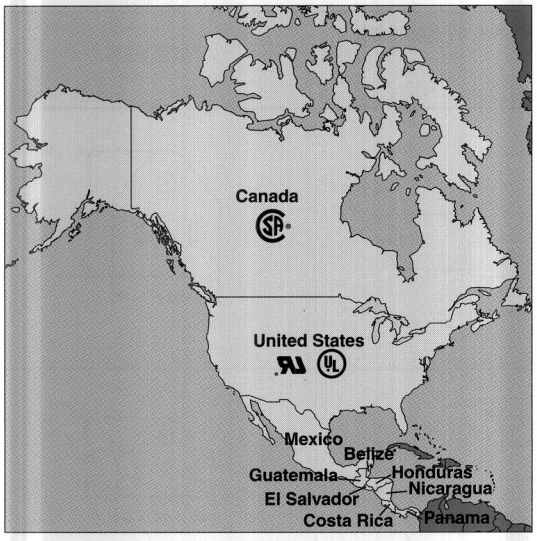
Fax toll-free: (800) 645-5360



North America

These cords utilize the NEMA 5-15P and 6-15P plug standards used in the United States and Canada. In the U.S., these straight-blade plugs are detailed in NEMA (National Electrical Manufacturers Association) publication WD6 and are incorporated into UL 498 by UL. Canadian plug and socket standards are outlined by CSA in publication C22.2, No. 42.

The NEMA 5-15P-style plug is also used in Mexico, Japan, parts of Korea, Taiwan, Central America, and on the west coast of South America. See pages 46-48 for Japanese cordsets.

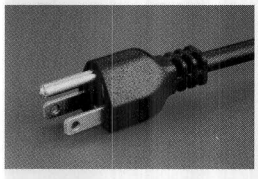
Panel Components Corporation cords and cordsets are listed by UL and, with the exception of the low-leakage hospital-grade cordset on pages 55-57, are certified by CSA.

Call for information on Panel Components Corporation's new custom colors and private labeling options.

NORTH AMERICA PLUG SPECIFICATIONS

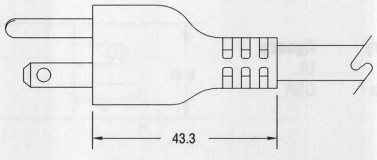
Standard: NEMA 5-15P (U.S.), C22.2, No. 42 (Canada)
Material: PVC
Plug approvals appear below

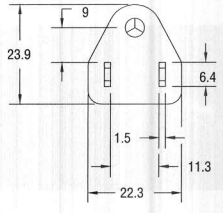
FACE VIEW

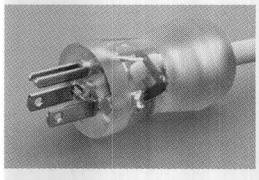


P04

Country	Agency
U.S.	UL
Canada	CSA



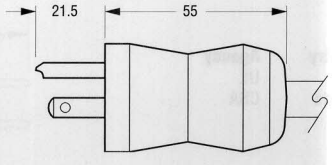


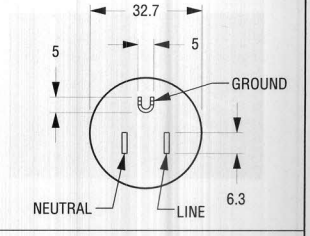


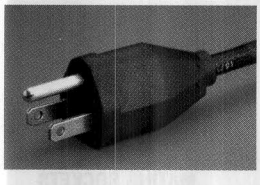
Clear or colored

PK2

Country	Agency
U.S.	UL
Canada	CSA

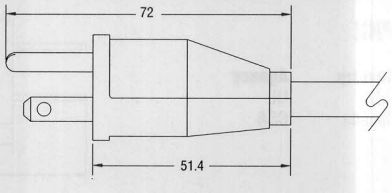


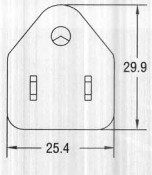




PK6

Country	Agency
U.S.	UL
Canada	CSA

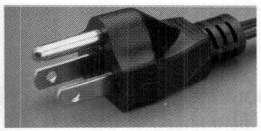




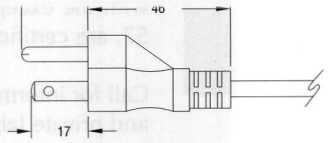
MATING SOCKETS

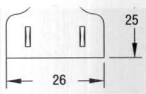
Part number	See page
88010641	110
88030290, Hospital	108
88030280, Hospital	108
Int'l Power Source	239

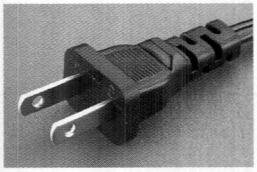
Dimensions in mm



Country	Agency
U.S.	UL
Canada	CSA

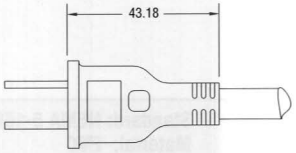


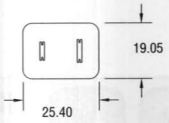


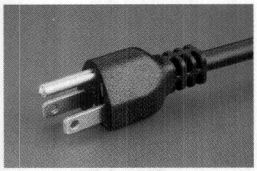


P16

Country	Agency
U.S.	UL
Canada	CSA

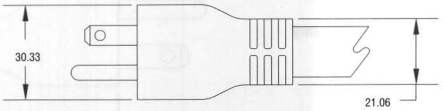


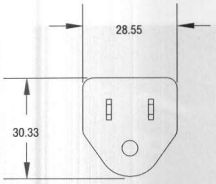


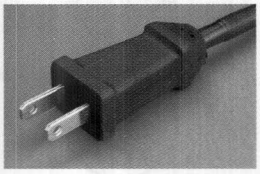


P18

Country	Agency
U.S.	UL
Canada	CSA

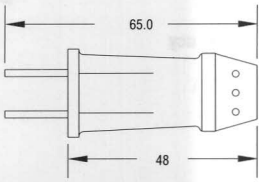


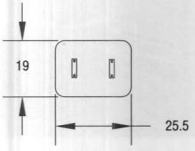


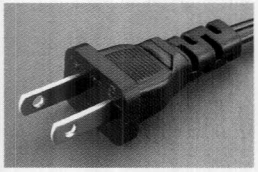


PN1

Country	Agency
U.S.	UL
Canada	CSA

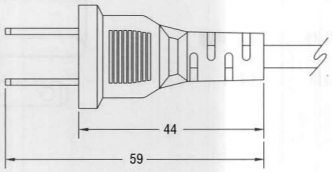






PN2

Country	Agency
U.S.	UL
Canada	CSA



MATING SOCKETS

Part number	See page
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88030280, Hospital	108
Int'l Power Source	239

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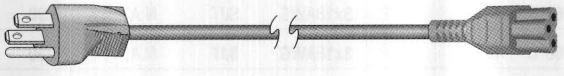
Fax toll-free: (800) 645-5360

For use at 2.5A/120VAC (60Hz)

2 or 3 x 18AWG conductor size – current rating limited by IEC 60320†† connector.

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 49 & 50	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86532120	UL CSA	2.5A/125 VAC	60°C	BLK	1.8m	PN1	TD1	—

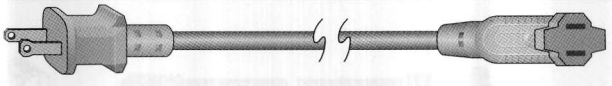
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking**	Nom. O.D.
	2x18AWG	SPT-2	N.A.*	29/0.18mm	—	flat

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 49 & 50	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86557100 	UL CSA	2.5A/125 VAC	60°C	BLK	1.8m	PK8	TH1	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking**	Nom. O.D.
	3x18AWG	SPT-2	N.A.*	41/0.16mm	—	flat

For use at 13A/125VAC

100ft extension cord. Available in other lengths. Call for more information.

	Approvals	Current/ Voltage Rating	Max. Cable Temp	Color	Length	Plug & End Termination Specifications: Plug p. 49 & 50	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86570100 	UL CSA	13A/125 VAC	105°C	BLK	30.5m	—	—	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking**	Nom. O.D.
	2x14AWG	SJTW	N.A.*	41/30AWG	—	9.0mm

Power Cords with 50/10mm jacket strip

Plug & End Termination Specifications: Plug - P04, page 49-50 & End Termination - T02, page 72-73
Available in custom lengths and color

PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American NEMA 5-15 plug: opposite end is stripped 50mm jacket/10mm conductor.		Current/ Voltage Rating	Max. Temp.†	Color	Length (±.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
70405000183	1.83m	**10A/125VAC**	60°C†	BLACK	**1.83**	**3x18AWG**	**SVT**	N.A.*	41/34	6.22
70405000244	2.44m	10A/125VAC	60°C†	BLACK	**2.44**	3x18AWG	SVT	N.A.*	41/34	6.22
70405000305	3.05m	10A/125VAC	60°C†	BLACK	**3.05**	3x18AWG	SVT	N.A.*	41/34	6.22
70401000183	1.83m	**10A/125VAC**	60°C	BLACK	**1.83**	**3x18AWG**	**SJT**	N.A.*	16/30	7.82
70401000244	2.44m	10A/125VAC	60°C	BLACK	**2.44**	3x18AWG	SJT	N.A.*	16/30	7.82
70401000305	3.05m	10A/125VAC	60°C	BLACK	**3.05**	3x18AWG	SJT	N.A.*	16/30	7.82
70403000183	1.83m	**13A/125VAC**	60°C	BLACK	**1.83**	**3x16AWG**	**SJT**	N.A.*	26/30	8.51
70403000244	2.44m	13A/125VAC	60°C	BLACK	**2.44**	3x16AWG	SJT	N.A.*	26/30	8.51
70403000305	3.05m	13A/125VAC	60°C	BLACK	**3.05**	3x16AWG	SJT	N.A.*	26/30	8.51
70404000183	1.83m	**15A/125VAC**	60°C	BLACK	**1.83**	**3x14AWG**	**SJT**	N.A.*	41/30	9.40
70404000244	2.44m	15A/125VAC	60°C	BLACK	**2.44**	3x14AWG	SJT	N.A.*	41/30	9.40
70404000305	3.05m	15A/125VAC	60°C	BLACK	**3.05**	3x14AWG	SJT	N.A.*	41/30	9.40

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground) N.A. — North American: black (line), white (neutral), green (ground)
** Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.
† Cordage of this assembly carries a temperature rating of 105°C.

Cordsets with T02 style** IEC 60320†† connector

Plug & End Termination Specifications: Plug - P04, page 49-50 & End Termination - T02, page 72-73
Available in custom lengths and colors.

PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American NEMA 5-15 plug with straight IEC 60320†† Standard sheet C13 connector		**Current/ Voltage Rating**	**Max. Temp.**	**Color**	**Length (±.10m)**	**Conductor Size**	**Descript.**	**Wiring**	**Approx. Stranding**	**Nominal O.D.(mm)**
70405020234	2.34m	**10A/125VAC**	60°C†	BLACK	**2.34**	**3x18AWG**	**SVT**	N.A.*	41/34	6.22
70401020091	0.91m	**10A/125VAC**	60°C	BLACK	**0.91**	**3x18AWG**	**SJT**	N.A.*	16/30	7.82
70401020183	1.83m	10A/125VAC	60°C	BLACK	**1.83**	3x18AWG	SJT	N.A.*	16/30	7.82
70401020244	2.44m	10A/125VAC	60°C	BLACK	**2.44**	3x18AWG	SJT	N.A.*	16/30	7.82
70401020274	2.74m	10A/125VAC	60°C	BLACK	**2.74**	3x18AWG	SJT	N.A.*	16/30	7.82
70401020305	3.05m	10A/125VAC	60°C	BLACK	**3.05**	3x18AWG	SJT	N.A.*	16/30	7.82
70403020031	0.31m	**13A/125VAC**	60°C	BLACK	**0.31**	**3x16AWG**	**SJT**	N.A.*	26/30	8.51
70403020061	0.61m	13A/125VAC	60°C	BLACK	**0.61**	3x16AWG	SJT	N.A.*	26/30	8.51
70403020092	0.92m	13A/125VAC	60°C	BLACK	**0.92**	3x16AWG	SJT	N.A.*	26/30	8.51
70403020122	1.22m	13A/125VAC	60°C	BLACK	**1.22**	3x16AWG	SJT	N.A.*	26/30	8.51
70403020153	1.53m	13A/125VAC	60°C	BLACK	**1.53**	3x16AWG	SJT	N.A.*	26/30	8.51
70403020183	1.83m	13A/125VAC	60°C	BLACK	**1.83**	3x16AWG	SJT	N.A.*	26/30	8.51
70403020214	2.14m	13A/125VAC	60°C	BLACK	**2.14**	3x16AWG	SJT	N.A.*	26/30	8.51
70403020244	2.44m	13A/125VAC	60°C	BLACK	**2.44**	3x16AWG	SJT	N.A.*	26/30	8.51
70403020305	3.05m	13A/125VAC	60°C	BLACK	**3.05**	3x16AWG	SJT	N.A.*	26/30	8.51

Cordsets with T07 style** IEC 60320†† connector

Plug & End Termination Specifications: Plug - P04, page 49-50 & End Termination - T07, page 72-73
Available in custom lengths and colors.

PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American NEMA 5-15 plug with IEC 60320†† standard sheet C13 connector		**Current/ Voltage Rating**	**Max. Temp.**	**Color**	**Length (±.10m)**	**Conductor Size**	**Descript.**	**Wiring**	**Approx. Stranding**	**Nominal O.D.(mm)**
70405070234	2.34m	**10A/125VAC**	60°C†	BLACK	**2.34**	**3x18AWG**	**SVT**	N.A.*	41/34	6.22
70403070183	1.83m	**13A/125VAC**	60°C	BLACK	**1.83**	**3x16AWG**	**SJT**	N.A.*	26/30	8.51
70403070244	2.44m	13A/125VAC	60°C	BLACK	**2.44**	3x16AWG	SJT	N.A.*	26/30	8.51
70403070305	3.05m	13A/125VAC	60°C	BLACK	**3.05**	3x16AWG	SJT	N.A.*	26/30	8.51

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground) N.A. — North American: black (line), white (neutral), green (ground)

** The T0... style numbers are not part of the IEC standard for connectors. These numbers were developed by Panel Components Corporation for reference and clarification.

† Cordage of this assembly carries a temperature rating of 105°C.

†† As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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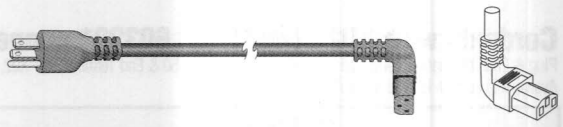
Cordsets with T05 style** IEC 60320†† connector

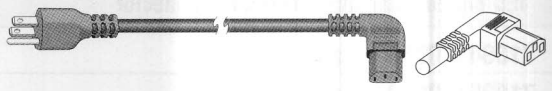
Plug & End Termination Specifications: Plug - P04, page 49-50 & End Termination - T05, page 72-73
Available in custom lengths and colors.



PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American NEMA 5-15 plug with IEC 60320†† standard sheet C13 connector		Current/ Voltage Rating	Max. Temp.	Color	Length (±.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
70405050234	2.34m	**10A/125VAC**	60°C†	BLACK	**2.34**	**3x18AWG**	**SVT**	N.A.*	41/34	6.22
70403050183	1.83m	**13A/125VAC**	60°C	BLACK	**1.83**	**3x16AWG**	**SJT**	N.A.*	26/30	8.51
70403050244	2.44m	13A/125VAC	60°C	BLACK	**2.44**	3x16AWG	SJT	N.A.*	26/30	8.51
70403050305	3.05m	13A/125VAC	60°C	BLACK	**3.05**	3x16AWG	SJT	N.A.*	26/30	8.51

Cordsets with T03 style** IEC 60320†† connector

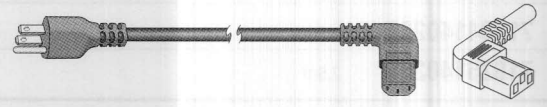
Plug & End Termination Specifications: Plug - P04, page 49-50 & End Termination - T03, page 72-73
Available in custom lengths and colors.



PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American NEMA 5-15 plug with IEC 60320†† standard sheet C13 connector		Current/ Voltage Rating	Max. Temp.	Color	Length (±.10)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
70405030234	2.34m	**10A/125VAC**	60°C†	BLACK	**2.34**	**3x18AWG**	**SVT**	N.A.*	41/34	6.22
70403030031	0.31m	**13A/125VAC**	60°C	BLACK	**0.31**	**3x16AWG**	**SJT**	N.A.*	26/30	8.51
70403030061	0.61m	13A/125VAC	60°C	BLACK	**0.61**	3x16AWG	SJT	N.A.*	26/30	8.51
70403030092	0.92m	13A/125VAC	60°C	BLACK	**0.92**	3x16AWG	SJT	N.A.*	26/30	8.51
70403030122	1.22m	13A/125VAC	60°C	BLACK	**1.22**	3x16AWG	SJT	N.A.*	26/30	8.51
70403030153	1.53m	13A/125VAC	60°C	BLACK	**1.53**	3x16AWG	SJT	N.A.*	26/30	8.51
70403030183	1.83m	13A/125VAC	60°C	BLACK	**1.83**	3x16AWG	SJT	N.A.*	26/30	8.51
70403030214	2.14m	13A/125VAC	60°C	BLACK	**2.14**	3x16AWG	SJT	N.A.*	26/30	8.51
70403030244	2.44m	13A/125VAC	60°C	BLACK	**2.44**	3x16AWG	SJT	N.A.*	26/30	8.51
70403030305	3.05m	13A/125VAC	60°C	BLACK	**3.05**	3x16AWG	SJT	N.A.*	26/30	8.51

Cordsets with T06 style** IEC 60320†† connector

Plug & End Termination Specifications: Plug - P04, page 49-50 & End Termination - T06, page 72-73
Available in custom lengths and colors.



PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American NEMA 5-15 plug with IEC 60320†† standard sheet C13 connector		Current/ Voltage Rating	Max. Temp.	Color	Length (±.10)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
70405060234	2.34m	**10A/125VAC**	60°C†	BLACK	**2.34**	**3x18AWG**	**SVT**	N.A.*	41/34	6.22
70403060183	1.83m	**13A/125VAC**	60°C	BLACK	**1.83**	**3x16AWG**	**SJT**	N.A.*	26/30	8.51
70403060244	2.44m	13A/125VAC	60°C	BLACK	**2.44**	3x16AWG	SJT	N.A.*	26/30	8.51
70403060305	3.05m	13A/125VAC	60°C	BLACK	**3.05**	3x16AWG	SJT	N.A.*	26/30	8.51

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground) N.A. — North American: black (line), white (neutral), green (ground)

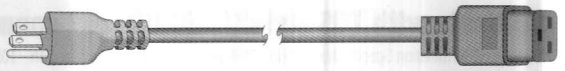
** The T0... style numbers are not part of the IEC standard for connectors. These numbers were developed by Panel Components Corporation for reference and clarification.

† Cordage of this assembly carries a temperature rating of 105°C.

†† As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Cordsets with X02 style** IEC 60320* connector

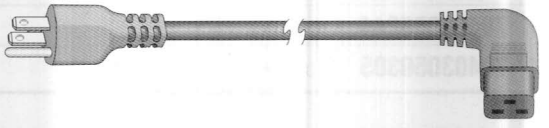
Plug & End Termination Specifications: Plug - P18, page 49-50 & End Termination - X02, page 72-73
Available in custom lengths and colors.



PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American Large NEMA 5-15 plug with IEC 60320* standard sheet C19 connector		Current/ Voltage Rating	Max. Temp.†	Color	Length (.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.
71804110250	2.5m	**15A/125VAC**	60°C	BLACK	**2.5**	**3x14AWG**	**SJT**	N.A.*	41/30	9.4mm
71825110250	2.5m	**15A/125VAC**	60°C	BLACK	2.5	**3x12AWG**	SJT	N.A.*	65/30	11.0mm

Cordsets with X03 style** IEC 60320* connector

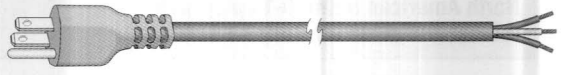
Plug & End Termination Specifications: Plug - P18, page 49-50 & End Termination - X03, page 72-73
Available in custom lengths and colors.



PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American Large NEMA 5-15 plug with IEC 60320* standard sheet C19 connector		Current/ Voltage Rating	Max. Temp.†	Color	Length (.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.
71804120250	2.5m	**15A/125VAC**	60°C	BLACK	**2.5**	**3x14AWG**	**SJT**	N.A.*	41/30	9.4mm
71825120250	2.5m	**15A/125VAC**	60°C	BLACK	2.5	**3x12AWG**	SJT	N.A.*	65/30	11.0mm

Power Cords with 50/10mm jacket strip

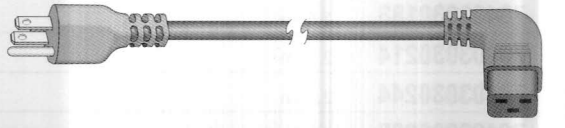
Plug & End Termination Specifications: Plug - P18, page 49-50 & End Termination - TJ3, page 72-73
Available in custom lengths and colors.



PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American Large NEMA 5-15 plug		Current/ Voltage Rating	Max. Temp.†	Color	Length (.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.
71804000250	2.5m	**15A/125VAC**	60°C	BLACK	**2.5**	**3x14AWG**	**SJT**	N.A.*	41/30	9.4mm
71825000250	2.5m	**15A/125VAC**	60°C	BLACK	2.5	**3x12AWG**	SJT	N.A.*	65/30	11.0mm

Cordsets with X06 style** IEC 60320* connector

Plug & End Termination Specifications: Plug - P18, page 49-50 & End Termination - X06, page 72-73
Available in custom lengths and colors.



PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American Large NEMA 5-15P plug with IEC 60320* standard sheet C19 connector		Current/ Voltage Rating	Max. Temp.†	Color	Length (.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.
71804140250	2.5m	**15A/125VAC**	60°C	BLACK	**2.5**	**3x14AWG**	**SJT**	N.A.*	41/30	9.4mm
71825140250	2.5m	**15A/125VAC**	60°C	BLACK	2.5	**3x12AWG**	SJT	N.A.*	65/30	11.0mm

Power Cords with 50/10mm jacket strip

Plug & End Termination Specifications: End Termination - TJ3, page 49-50 & Connector - X02, page 72-73
Available in custom lengths and colors.

PART NUMBER		RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
IEC 60320* standard sheet C19 connector		Current/ Voltage Rating	Max. Temp.†	Color	Length (.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.
70004110250	2.5m	**18A/250VAC**	60°C	BLACK	**2.5**	**3x14AWG**	**SJT**	N.A.*	41/30	9.4mm
70025110250	2.5m	**20A/250VAC**	60°C	BLACK	2.5	**3x12AWG**	SJT	N.A.*	65/30	11.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground) N.A. — North American: black (line), white (neutral), green (ground)

** The T0... style numbers are not part of the IEC standard for connectors. These numbers were developed by Panel Components Corporation for reference and clarification.

† Cordage of this assembly carries a temperature rating of 105°C.

†† As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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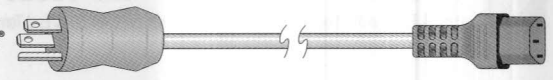
North American Molded Hospital-Grade Power Cords & Cordsets

We have all the angles...*from stock!* These hospital-grade power cords and cordsets utilize the NEMA 5-15 plug and one of five different cable entry designs of IEC 60320†† C13 connectors. They are designed for use in hospital and medical settings and carry the characteristic "green dot" indicating hospital grade on the plug. Thirty-six standard configurations are available from stock. If you don't see what you need, call our Customer Service Department for assistance at (800) 662-2290. See page 70 for connector locks.

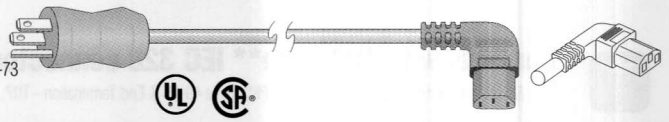
Cordsets with T02 style** IEC 60320†† connector



Plug & End Termination Specifications: Plug - PK2, page 49-50 & End Termination - T02, page 72-73

PART NUMBER			RATINGS AND DESCRIPTION				CABLE SPECIFICATIONS				
North American medical plug with straight IEC 60320†† standard sheet C13 connector		Plug Color	Current/ Voltage Rating	Max. Temp.	Cord. Color	Length (±.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
86610610	3.0m	CLEAR	10A/125VAC	60°C†	BLACK	**3.0**	**3x18AWG**	**SJTO**	N.A.*	16/30	8.26
86610710	3.0m	BLACK	10A/125VAC	60°C†	BLACK	3.0	3x18AWG	SJTO	N.A.*	16/30	8.26
86610810	3.0m	GRAY	10A/125VAC	60°C†	GRAY	3.0	3x18AWG	SJT	N.A.*	16/30	8.26
86610910	3.7m	CLEAR	13A/125VAC	60°C†	BLACK	**3.7**	**3x16AWG**	SJTO	N.A.*	26/30	8.51
86611010	3.7m	BLACK	13A/125VAC	60°C†	BLACK	3.7	3x16AWG	SJTO	N.A.*	26/30	8.51
86611110	3.7m	GRAY	13A/125VAC	60°C†	GRAY	3.7	3x16AWG	SJT	N.A.*	26/30	8.51

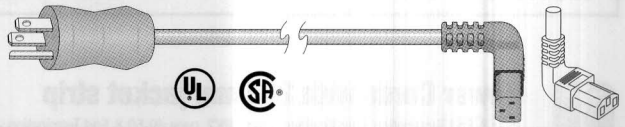
Cordsets with T03 style** IEC 60320†† connector



Plug & End Termination Specifications: Plug - PK2, page 49-50 & End Termination - T03, page 72-73

PART NUMBER			RATINGS AND DESCRIPTION				CABLE SPECIFICATIONS				
North American medical plug with IEC 60320†† standard sheet C13 connector		Plug Color	Current/ Voltage Rating	Max. Temp.	Cord. Color	Length (±.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
86610620	3.0m	CLEAR	10A/125VAC	60°C†	BLACK	**3.0**	**3x18AWG**	**SJTO**	N.A.*	16/30	8.26
86610720	3.0m	BLACK	10A/125VAC	60°C†	BLACK	3.0	3x18AWG	SJTO	N.A.*	16/30	8.26
86610820	3.0m	GRAY	10A/125VAC	60°C†	GRAY	3.0	3x18AWG	SJT	N.A.*	16/30	8.26
86610920	3.7m	CLEAR	13A/125VAC	60°C†	BLACK	**3.7**	**3x16AWG**	SJTO	N.A.*	26/30	8.51
86611020	3.7m	BLACK	13A/125VAC	60°C†	BLACK	3.7	3x16AWG	SJTO	N.A.*	26/30	8.51
86611120	3.7m	GRAY	13A/125VAC	60°C†	GRAY	3.7	3x16AWG	SJT	N.A.*	26/30	8.51

Cordsets with T05 style** IEC 60320†† connector



Plug & End Termination Specifications: Plug - PK2, page 49-50 & End Termination - T05, page 72-73

PART NUMBER			RATINGS AND DESCRIPTION				CABLE SPECIFICATIONS				
North American medical plug with IEC 60320†† standard sheet C13 connector		Plug Color	Current/ Voltage Rating	Max. Temp.	Cord. Color	Length (±.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
86610630	3.0m	CLEAR	10A/125VAC	60°C†	BLACK	**3.0**	**3x18AWG**	**SJTO**	N.A.*	16/30	8.26
86610730	3.0m	BLACK	10A/125VAC	60°C†	BLACK	3.0	3x18AWG	SJTO	N.A.*	16/30	8.26
86610830	3.0m	GRAY	10A/125VAC	60°C†	GRAY	3.0	3x18AWG	SJT	N.A.*	16/30	8.26
86610930	3.7m	CLEAR	13A/125VAC	60°C†	BLACK	**3.7**	**3x16AWG**	SJTO	N.A.*	26/30	8.51
86611030	3.7m	BLACK	13A/125VAC	60°C†	BLACK	3.7	3x16AWG	SJTO	N.A.*	26/30	8.51
86611130	3.7m	GRAY	13A/125VAC	60°C†	GRAY	3.7	3x16AWG	SJT	N.A.*	26/30	8.51

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground) N.A. — North American: black (line), white (neutral), green (ground)

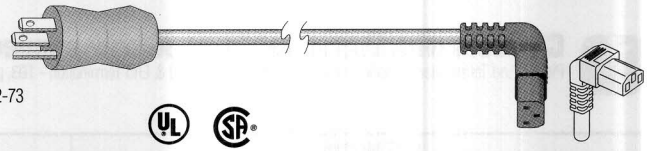
** The T0... style numbers are not part of the IEC standard for connectors. These numbers were developed by Panel Components Corporation for reference and clarification.

† Cordage of this assembly carries a temperature rating of 105°C.

†† As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

86610740	3.0m	BLACK	10A/125VAC	60°C†	BLACK	3.0	3x18AWG	SJTO	N.A.*	16/30	8.26
86610840	3.0m	GRAY	10A/125VAC	60°C†	GRAY	3.0	3x18AWG	SJT	N.A.*	16/30	8.26
86610940	3.7m	CLEAR	13A/125VAC	60°C†	BLACK	**3.7**	**3x16AWG**	SJTO	N.A.*	26/30	8.51
86611040	3.7m	BLACK	13A/125VAC	60°C†	BLACK	3.7	3x16AWG	SJTO	N.A.*	26/30	8.51
86611140	3.7m	GRAY	13A/125VAC	60°C†	GRAY	3.7	3x16AWG	SJT	N.A.*	26/30	8.51

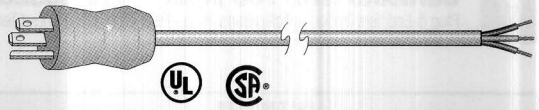
Cordsets with T07 style** IEC 320 connector



Plug & End Termination Specifications: Plug - PK2, page 49-50 & End Termination - T07, page 72-73

PART NUMBER			RATINGS AND DESCRIPTION				CABLE SPECIFICATIONS				
North American medical plug with IEC 320 standard sheet C13 connector		**Plug Color**	**Current/ Voltage Rating**	**Max. Temp.**	**Cord. Color**	**Length (±.10m)**	**Conductor Size**	**Descript.**	**Wiring**	**Approx. Stranding**	**Nominal O.D.(mm)**
86610650	3.0m	CLEAR	10A/125VAC	60°C†	BLACK	**3.0**	**3x18AWG**	**SJTO**	N.A.*	16/30	8.26
86610750	3.0m	BLACK	10A/125VAC	60°C†	BLACK	3.0	3x18AWG	SJTO	N.A.*	16/30	8.26
86610850	3.0m	GRAY	10A/125VAC	60°C†	GRAY	3.0	3x18AWG	SJT	N.A.*	16/30	8.26
86610950	3.7m	CLEAR	13A/125VAC	60°C†	BLACK	**3.7**	**3x16AWG**	SJTO	N.A.*	26/30	8.51
86611050	3.7m	BLACK	13A/125VAC	60°C†	BLACK	3.7	3x16AWG	SJTO	N.A.*	26/30	8.51
86611150	3.7m	GRAY	13A/125VAC	60°C†	GRAY	3.7	3x16AWG	SJT	N.A.*	26/30	8.51

Power Cords with 20/5mm jacket strip



Plug & End Termination Specifications: Plug - PK2, page 49-50 & End Termination - TJ6, page 72-73

PART NUMBER			RATINGS AND DESCRIPTION				CABLE SPECIFICATIONS				
North American medical plug: opposite end is stripped with 20mm jacket/5mm conductor		**Plug Color**	**Current/ Voltage Rating**	**Max. Temp.**	**Cord. Color**	**Length (±.10m)**	**Conductor Size**	**Descript.**	**Wiring**	**Approx. Stranding**	**Nominal O.D.(mm)**
86610400	3.0m	CLEAR	10A/125VAC	60°C†	GRAY	**3.0**	**3x18AWG**	**SJT**	INT'L*	16/30	8.26
86610600	3.0m	CLEAR	10A/125VAC	60°C†	BLACK	3.0	3x18AWG	SJTO	N.A.*	16/30	8.26
86610700	3.0m	BLACK	10A/125VAC	60°C†	BLACK	3.0	3x18AWG	SJTO	N.A.*	16/30	8.26
86610800	3.0m	GRAY	10A/125VAC	60°C†	GRAY	3.0	3x18AWG	SJT	N.A.*	16/30	8.26
86610900	3.7m	CLEAR	13A/125VAC	60°C†	BLACK	**3.7**	**3x16AWG**	SJTO	N.A.*	26/30	8.51
86611000	3.7m	BLACK	13A/125VAC	60°C†	BLACK	3.7	3x16AWG	SJTO	N.A.*	26/30	8.51
86611100	3.7m	GRAY	13A/125VAC	60°C†	GRAY	3.7	3x16AWG	SJT	N.A.*	26/30	8.51

* Conductor Wiring Color Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground). N.A.—North American: black (line), white (neutral), green (ground).

** The T0... style numbers are not part of the IEC standard for connectors. These numbers were developed by Interpower Components Ltd. for reference and clarification.

† Cable of this assembly carries a temperature rating of 105°C.

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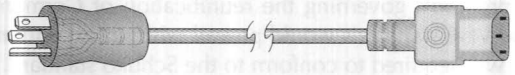
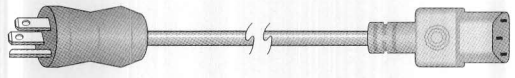
Fax toll-free: (800) 645-5360

North American Molded Hospital-Grade Power Cords & Cordsets, continued

Plug & End Termination Specifications: Plug - PK2, page 49-50 & End Termination - TC5, page 72-73

PART NUMBER	RATINGS AND DESCRIPTION					CABLE SPECIFICATIONS				
North American NEMA 5-15 plug; opposite end is IEC 60320†† standard sheet C13.	Approvals	Current/ Voltage Rating	Max. Temp.	Color	Length (±.10m)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
N. American Cordset with clear plug **86610301** 	UL CSA	10A/ 125VAC	60°C†	Gray/ Clear plug	3m	3x18 AWG	SJT	INT'L.*	16/30	8.26
N. American Low-leakage Cordset (5µA/10feet) **86610500** 	UL	10A/ 125VAC	60°C	Gray/ Gray plug	3m	3x18 AWG	SJT	N.A.*	41/34	11.48

North American Durable Rubber Power Cords

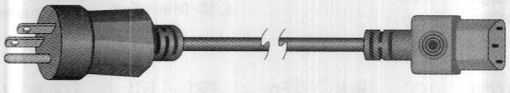
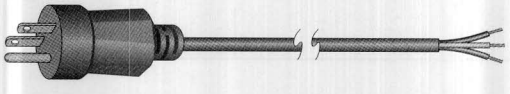
UL CSA

nonpolarized

PART NUMBER				RATINGS AND DESCRIPTION				CORDAGE SPECIFICATIONS				
North American NEMA 1-15 plug; opposite end is stripped 150mm jacket/9mm conductor.				Current/ Voltage Rating	Max. Temp.	Color	Length (±.10)	Conductor Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
86560010	3.05m	Plug: PN1	Connector: TJ4	**10A/125VAC**	60°C	BLACK	3m	2x18AWG	SJ	N.A.*	41/34	7.5
86560020	3.05m	Plug: PN1	Connector: TJ4	**13A/125VAC**	60°C	BLACK	3m	2x16AWG	SJ	N.A.*	65/34	8.0
86560030	3.05m	Plug: PK6	Connector: TJ4	**10A/125VAC**	60°C	BLACK	3m	3x18AWG	SJ	N.A.*	41/34	8.0
86560040	3.05m	Plug: PK6	Connector: TJ4	**13A/125VAC**	60°C	BLACK	3m	3x16AWG	SJ	N.A.*	65/34	8.7
86560050	3.05m	Plug: PK7	Connector: TJ4	**15A/125VAC**	60°C	BLACK	3m	3x14AWG	SOW	N.A.*	41/30	13.8

North American High-Power Cord & Cordset

Plug & End Termination Specifications: Plug - PK4, page 49-50 & End Termination - TC5 or TJ1, page 72-73

PART NUMBER	RATINGS AND DESCRIPTION					CORDAGE SPECIFICATIONS				
North American plug NEMA 6-15; opposite end is IEC 60320†† cable connector or 50mm jacket/5mm conductor strip.	Approvals	Current/ Voltage Rating	Max. Temp.	Color	Length (±.10)	Conduct Size	Descript.	Wiring	Approx. Stranding	Nominal O.D.(mm)
North American High-Power Cordset **86610100** 	UL CSA	10A/ 250VAC	60°C	BLACK	2.44	3x18 AWG	SJT	N.A.*	16/30	8.51
North American High-Power Cord **86610200** 	UL CSA	10A/ 250VAC	60°C	BLACK	3.04	3x18 AWG	SJT	N.A.*	16/30	8.51

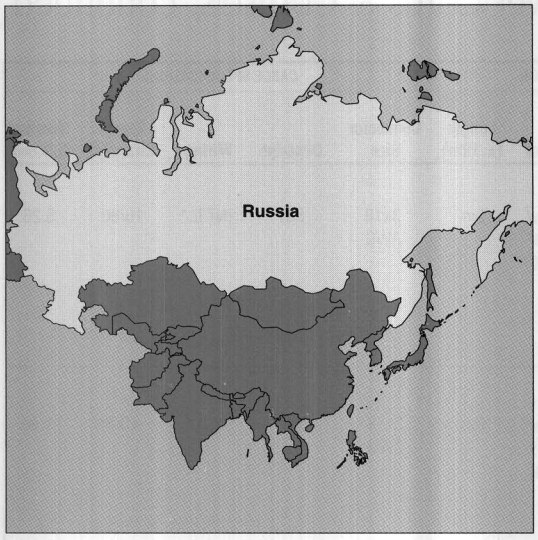
Note: Other assemblies available (Handmade/Custom Order). See pages 75-86 for samples of options available with the North American plug.

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground) N.A. — North American: black (line), white (neutral), green (ground)

** The TO... style numbers are not part of the IEC standard for connectors. These numbers were developed by Panel Components Corporation for reference and clarification.

† Cordage of this assembly carries a temperature rating of 105°C.

†† As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.



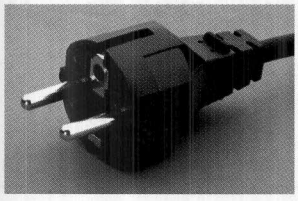
Russia

The Soviet Republics use a standard plug and socket defined in Russian Standard Gost 7396, which is similar to the CEE 7/7 ("Schuko") standard. Contacts are also on 19mm centers, but the diameter of this contact is 4.0mm compared to 4.8mm which is standard in Continental Europe. Reliable information on Eastern European standards is still difficult to access. The standard used in the former Yugoslavia is virtually identical to the Schuko standard. Furthermore, one of the protocols governing the reunification of Germany provided that the DIN and VDE standards would prevail **without exception.** The former East Germany was required to conform to the Schuko standard.

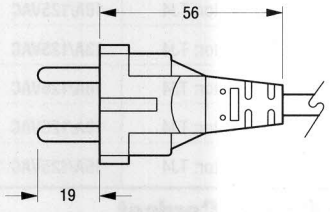
RUSSIA SPECIFICATIONS

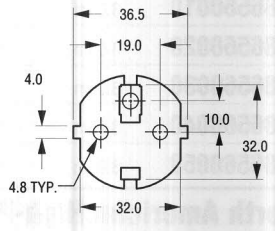
Standard: Gost 7396
Material: PVC
Plug approvals appear below

FACE VIEW



PR1 **Country** Russia **Agency** —





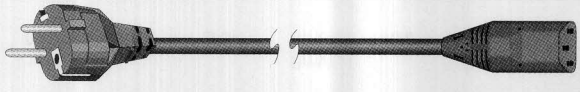
Dimensions in mm

For use at 10A/220VAC (50Hz)

3 x 1.00mm² conductor size – current rating according to CENELEC HD-21.

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 58	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
	10A/250 VAC	70°C	BLK	2.5m	PR1	TC1	Connector lock, 85910010, see p. 70

86513060



CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

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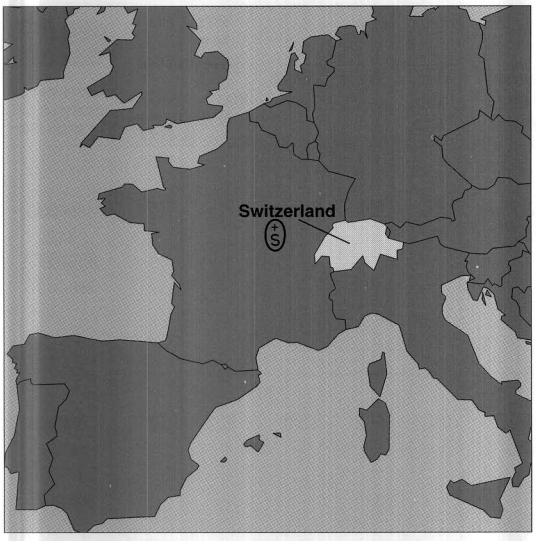


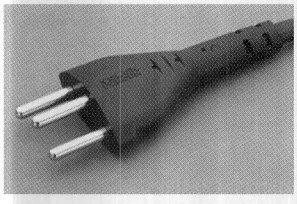
Switzerland

The Swiss plug is specified in SEV 1011. It is a variation of the CEE 7 plugs and sockets used throughout most of Europe, but because of the grounding pin, this Swiss version does not mate with the CEE types. These cords are rated at 250VAC and approved by ETSI, the Swiss safety agency.

SWITZERLAND SPECIFICATIONS

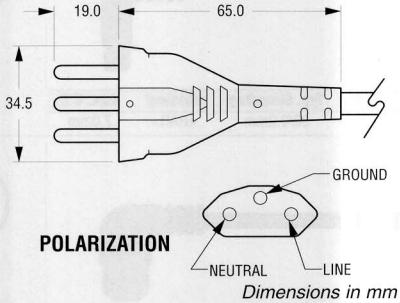
Standard: SEV 1011
Material: PVC
Plug approvals appear below

FACE VIEW



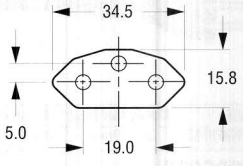
PL1

Country	Agency
Switzerland	ETSI



POLARIZATION

Dimensions in mm



MATING SOCKETS

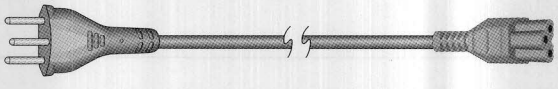
Part number	See page
88010330	112
88010530	112
88010431	112
Int'l Socket Strips	230-231

For use at 2.5A/230VAC (50Hz)

*2 or 3 x 0.75mm² conductor size – current rating limited by IEC 60320** connector.*

Approvals	Current/ Voltage Rating	Max. Cable Temp	Color	Length	Plug & End Termination Specifications: Plug p. 59	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
+S	2.5A/250 VAC	70°C	BLK	1.8m	PL1	TH1	—

86557170

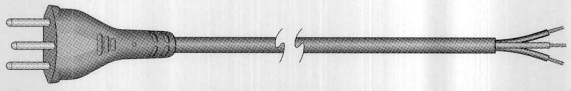


CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	H03VVF3G0.75	INT'L*	24/0.2	<HAR>	5.8mm

For use at 10A/230VAC (50Hz)

Approvals	Current/ Voltage Rating	Max. Cable Temp	Color	Length	Plug & End Termination Specifications: Plug p. 59	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
+S	10A/250 VAC	70°C	BLK	2.5m	PL1	TJ1	Strain Reliefs 85820520 or 85820120 pp. 151-152

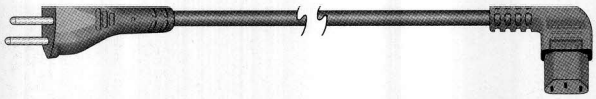
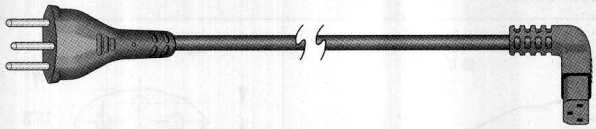
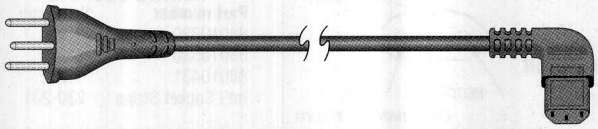
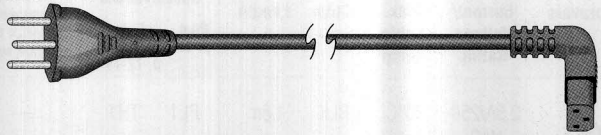
86521040



CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

Note: For a Swiss Class II cordset with an IEC 60320** sheet C7 connector, see the Eurocord (86532100 on page 27.)

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.
** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

											85910071 see p. 70
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.					
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm					
86396020							10A/250 VAC	70°C	BLK	2.5m	PL1 T05 Connector lock, 85910071 see p. 70
											
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.					
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm					
86396030							10A/250 VAC	70°C	BLK	2.5m	PL1 T06 Connector lock, 85910071 see p. 70
											
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.					
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm					
86396040							10A/250 VAC	70°C	BLK	2.5m	PL1 T07 Connector lock, 85910071 see p. 70
											
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.					
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm					

Note: Other assemblies available (Handmade/Custom Order). See page 75-86 for samples of options available with the Swiss plug.

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.
** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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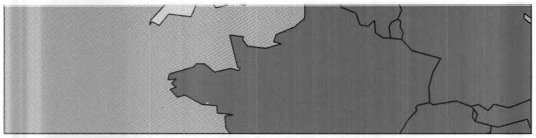


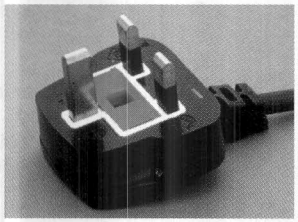
approved plugs, and these are tested by ASTA to BS 1363. ASTA requires that their mark be molded into the plug. Two other agencies play a role in testing cords and cordsets: BASEC tests cordage (which must conform to HAR standards) to BS 6500. BSI tests the appliance connector to BS 4491. Approval for the entire cordset is granted by ASTA.

Standard PCC British cords are approved by ASTA. They carry the ASTA mark and the safety label described above. See page 217 for replacement fuses.

U.K. & IRELAND PLUG SPECIFICATIONS

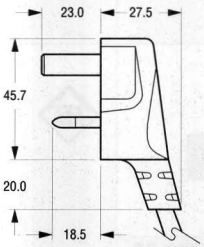
Standard: BS 1363
Material: PVC
Plug approvals appear below

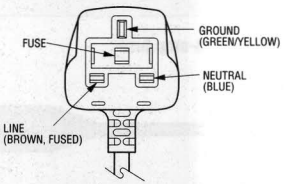
FACE VIEW



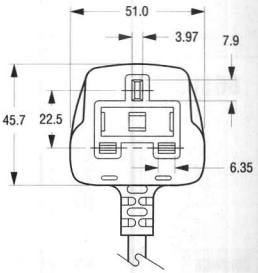
PD1

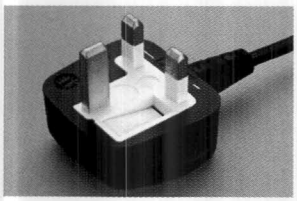
Country	Agency
U.K.	ASTA





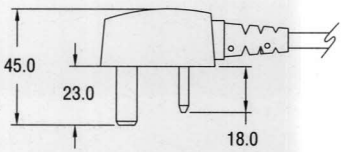
POLARIZATION





PD2

Country	Agency
U.K.	ASTA



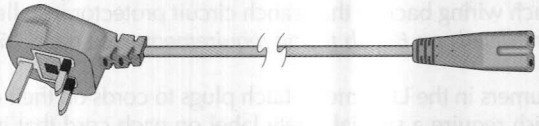
POLARIZATION

Dimensions in mm

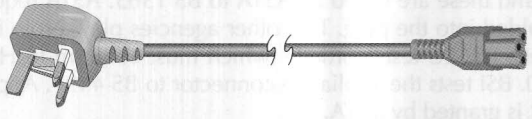
* Conductor Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
Marking: International Harmonized cordage may be marked on outer or inner conductor, or an identifying tracer thread can be incorporated with conductors.

For use at 2.5A/230VAC (50Hz)

2 or 3 x 0.75mm² conductor size – current rating limited by IEC 60320 connector.*

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specification: Plug p. 61	Plug & End Termination Specification: End Termination p. 72-73	Recommended connector lock or strain relief
86552100 Plug contains BS 1362 3-amp fuse 		2.5A/250 VAC	70°C	BLK	1.8m	PD1	TD1	—

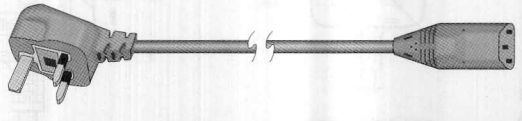
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	2x0.75mm²	H03VVH2-F0.75	INT'L*	32/0.32mm	<HAR>	flat

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specification: Plug p. 61	Plug & End Termination Specification: End Termination p. 72-73	Recommended connector lock or strain relief
86557140 Plug contains BS 1362 3-amp fuse 		2.5A/250 VAC	70°C	BLK	1.8m	PD2	TH1	—

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	H03VVF3G0.75	INT'L*	24/0.2mm	<HAR>	5.8mm

For use at 3A/230VAC (50Hz)

3 x 1.00mm² conductor size – current rating limited by BS 1362 fuse rated at 3A.

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 61	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86583000 Plug contains BS 1362 3-amp fuse 		3A/250 VAC	70°C	BLK	2.5m	PD1	TC1	Connector lock, 85910010 see p. 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

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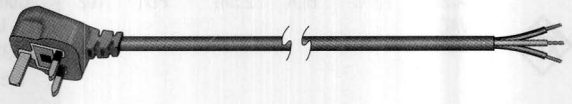
For use at 5A/230VAC (50Hz)

3 x 0.75mm² conductor size – current rating limited by BS 1362 fuse rated at 5A.

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 61	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
	5A/250 VAC	70°C	BLK	3.0m	PD1	TJ1	Strain reliefs, 85820520 or 85820120 pp. 151-152

86590012 **Plug contains BS 1362 5-amp fuse**



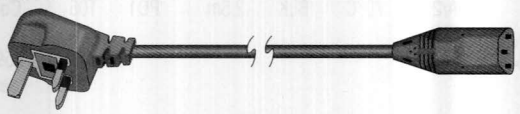
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x0.75mm²	H05VVF3G0.75	INT'L*	24/0.2mm	<HAR>	6.8mm

For use at 5A/230VAC (50Hz)

3 x 1.00mm² conductor size – current rating limited by BS 1362 fuse rated at 5A.

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 61	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
	5A/250 VAC	70°C	BLK	2.5m	PD1	TC1	Connector lock, 85910010, see p. 70

86552046 **Plug contains BS 1362 5-amp fuse**



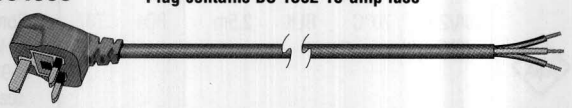
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

For use at 10A/230VAC (50Hz)

3 x 1.00mm² conductor size – current rating according to CENELEC HD-21.

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 61	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
	10A/250 VAC	70°C	BLK	2.5m	PD1	TJ1	Strain reliefs, 85820520 or 85820120 pp. 151-152

86584000 **Plug contains BS 1362 10-amp fuse**



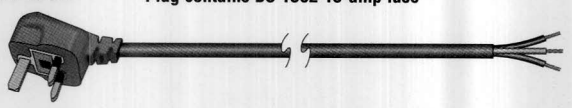
CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

For use at 10A/230VAC (50Hz)

3 x 1.00mm² conductor size – current rating according to CENELEC HD-21.

Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 61	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
	10A/250 VAC	70°C	BLK	2.5m	PD1	TJ1	Strain reliefs, 85820520 or 85820120 pp. 151-152

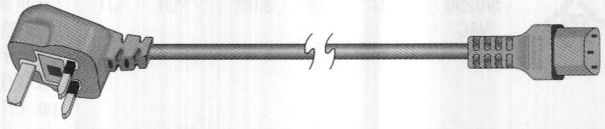
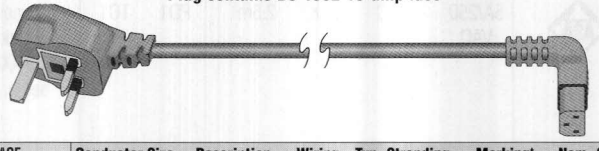
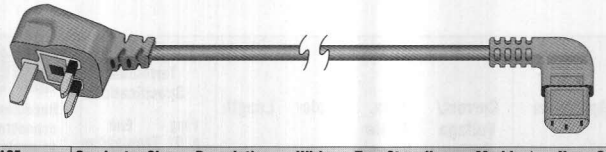
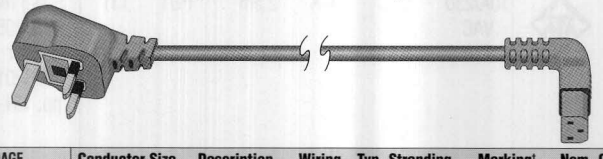
86554004 **Plug contains BS 1362 13-amp fuse**



CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.00mm²	H05VVF3G1.0	INT'L*	32/0.2mm	<HAR>	7.0mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

For use at 10A/230VAC (50Hz) *3 x 1.00mm² conductor size – current rating according to CENELEC HD-21 or IEC 60320***	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 61	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
86397060 Plug contains BS 1362 10-amp fuse 		10A/250 VAC	70°C	BLK	2.5m	PD1	T02	Connector lock, 85910071, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86397070 Plug contains BS 1362 10-amp fuse 		10A/250 VAC	70°C	BLK	2.5m	PD1	T03	Connector lock, 85910071, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86397080 Plug contains BS 1362 10-amp fuse 		10A/250 VAC	70°C	BLK	2.5m	PD1	T05	Connector lock, 85910071, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86397090 Plug contains BS 1362 10-amp fuse 		10A/250 VAC	70°C	BLK	2.5m	PD1	T06	Connector lock, 85910071, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86397100 Plug contains BS 1362 10-amp fuse 		10A/250 VAC	70°C	BLK	2.5m	PD1	T07	Connector lock, 85910071, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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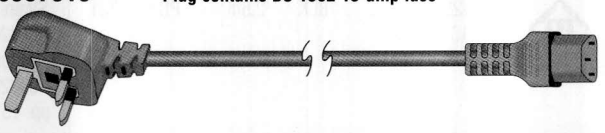
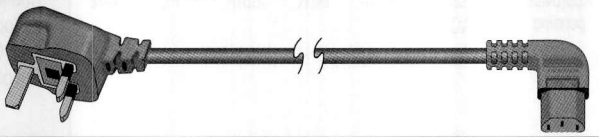
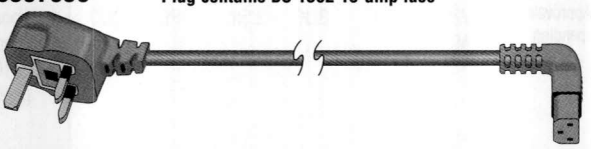
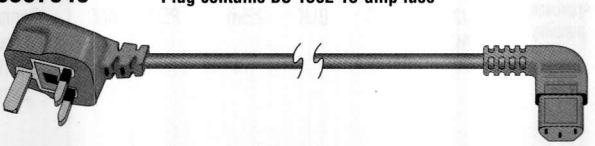
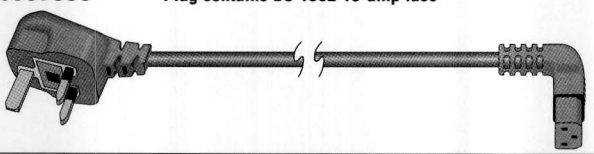
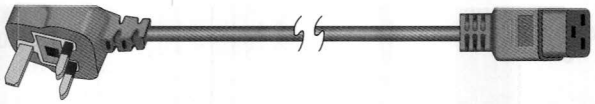
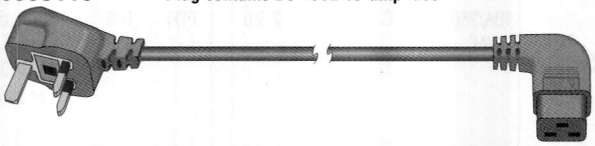
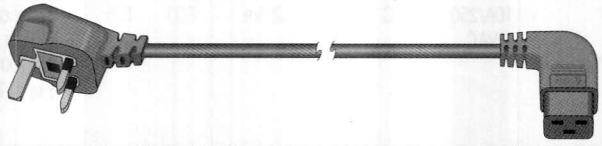
For use at 10A/230VAC (50Hz) *3 x 1.00mm² conductor size – current rating according to CENELEC HD-21.*	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications Plug p. 61	End Termination p. 72-73	Recommended connector lock or strain relief
86397010 **Plug contains BS 1362 13-amp fuse** 		10A/250 VAC	70°C	BLK	2.5m	PD1	T02	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86397020 **Plug contains BS 1362 13-amp fuse** 		10A/250 VAC	70°C	BLK	2.5m	PD1	T03	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86397030 **Plug contains BS 1362 13-amp fuse** 		10A/250 VAC	70°C	BLK	2.5m	PD1	T05	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86397040 **Plug contains BS 1362 13-amp fuse** 		10A/250 VAC	70°C	BLK	2.5m	PD1	T06	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								
86397050 **Plug contains BS 1362 13-amp fuse** 		10A/250 VAC	70°C	BLK	2.5m	PD1	T07	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size 3x1.00mm² · Description H05VVF3G1.0 · Wiring INT'L* · Typ. Stranding 32/0.2mm · Marking† <HAR> · Nom. O.D. 7.0mm								

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)
† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

							pending	VAC					85910051 page 70
	CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.						
		3x1.50mm²	H05VVF3G1.5	INT'L*	29/0.25mm	<HAR>	8.5mm						
86395110	**Plug contains BS 1362 13-amp fuse**						Approvals pending	13A/250 VAC	70°C	BLK	2.5m	PD1	X03	Connector lock, 85910051 page 70
													
	CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.						
		3x1.50mm²	H05VVF3G1.5	INT'L*	29/0.25mm	<HAR>	8.5mm						
86395100	**Plug contains BS 1362 13-amp fuse**						Approvals pending	13A/250 VAC	70°C	BLK	2.5m	PD1	X06	Connector lock, 85910051 page 70
													
	CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.						
		3x1.50mm²	H05VVF3G1.5	INT'L*	29/0.25mm	<HAR>	8.5mm						

Note: Other assemblies available (Handmade/Custom Order). See pages 75-86 for samples of options available with the United Kingdom plug.

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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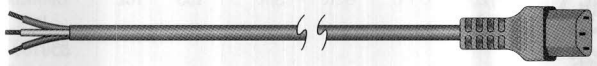
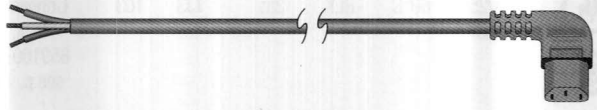
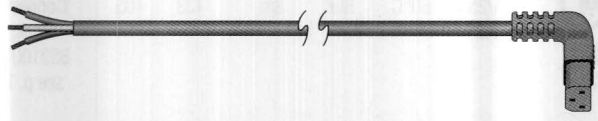
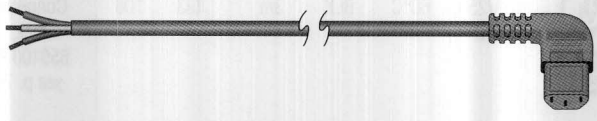
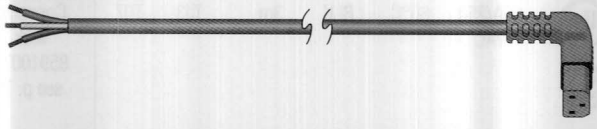
International IEC 60320** connector power cords

The cords below have IEC 60320** connectors molded onto harmonized cordage which allow *detachable* power connections at 10-16A internationally, depending on model. They are stripped and ready for installation of the correct plug. Plugs for international markets are shown on pages 87-115.

These assemblies are for use with rewireable plugs when a complete molded cordset is not available. Note that we can make assemblies for you. See our Made-to-order Cord Assembly Services on pages 75-86 for possible combinations—or call our Customer Service Department, toll free, for more information.

Important: **Specify models with Harmonized cordage for International applications; AWG-type for North American.**

International: For use at 10A/250VAC (50Hz) *3 x 1.00mm² conductor size – current rating according to CENELEC HD-21.*	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 73	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
70006020300 	The Australian Department of Fair Trading	10A/250 VAC	70°C	BLK	3m	TJ3	T02	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L* · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 6.3-8.0mm								
70006030300 	The Australian Department of Fair Trading	10A/250 VAC	70°C	BLK	3m	TJ3	T03	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L* · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 6.3-8.0mm								
86290100 	The Australian Department of Fair Trading	10A/250 VAC	70°C	BLK	3m	TJ3	T05	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L* · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 6.3-8.0mm								
86290110 	The Australian Department of Fair Trading	10A/250 VAC	70°C	BLK	3m	TJ3	T06	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L* · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 6.3-8.0mm								
86290120 	The Australian Department of Fair Trading	10A/250 VAC	70°C	BLK	3m	TJ3	T07	Connector lock, 85910071 see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x1.00mm² · Description: H05VVF3G1.0 · Wiring: INT'L* · Typ. Stranding: 32/0.2mm · Marking†: <HAR> · Nom. O.D.: 6.3-8.0mm								

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

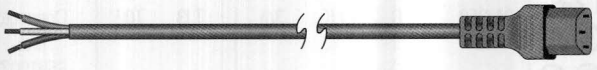
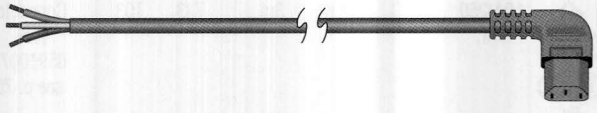
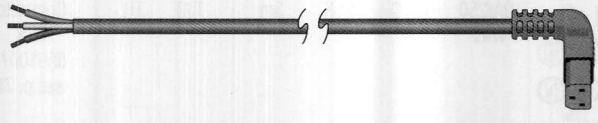
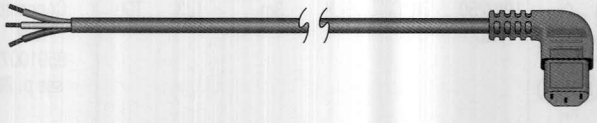
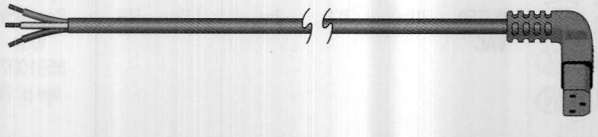
** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

North American IEC 60320** Connector Power Cords

The cords below have IEC 60320** connectors molded on to North American AWG cordage which allow *detachable* power connections at 10-20A (120/125VAC), depending on model. They are stripped and ready for installation of the correct plug.

Suitable NEMA plugs for the 10A power cord are shown on pages 98-101. Plugs appropriate for the 20A power cord are shown on pages 102-105. These assemblies are for use with rewireable plugs when a complete molded cordset is not available. Note that we can make assemblies for you. See our Made-to-order Cord Assembly Services on pages 75-86 for possible combinations—or call our Customer Service Department, toll free, for more information on custom lengths.

Important: **Do not specify these cords for International markets—see the models on page 67.**

North American: For use at 10A/250VAC (60Hz) *3x18AWG conductor size — current rating according to UL 817 & CSA 22.2. Also available in N.A. wiring color.*	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 73	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
70001020305 	UL CSA	10A/250 VAC	60°C	BLK	3m	TJ3	T02	Connector lock, 85910070, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x18AWG; Description: SJT; Wiring: N.A.*; Typ. Stranding: 16/30AWG; Marking: —; Nom. O.D.: 7.8mm								
86290200 	UL CSA	10A/250 VAC	60°C	BLK	3m	TJ3	T03	Connector lock, 85910070, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x18AWG; Description: SJT; Wiring: N.A.*; Typ. Stranding: 16/30AWG; Marking: —; Nom. O.D.: 7.8mm								
86290210 	UL CSA	10A/250 VAC	60°C	BLK	3m	TJ3	T05	Connector lock, 85910070, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x18AWG; Description: SJT; Wiring: N.A.*; Typ. Stranding: 16/30AWG; Marking: —; Nom. O.D.: 7.8mm								
86290220 	UL CSA	10A/250 VAC	60°C	BLK	3m	TJ3	T06	Connector lock, 85910070, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x18AWG; Description: SJT; Wiring: N.A.*; Typ. Stranding: 16/30AWG; Marking: —; Nom. O.D.: 7.8mm								
86290230 	UL CSA	10A/250 VAC	60°C	BLK	3m	TJ3	T07	Connector lock, 85910070, see p. 70
CORDAGE SPECIFICATIONS: Conductor Size: 3x18AWG; Description: SJT; Wiring: N.A.*; Typ. Stranding: 16/30AWG; Marking: —; Nom. O.D.: 7.8mm								

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground)

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. *The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.*

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Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360

International & North American Connector Power Cords

International power cords for use at 16A/250VAC

3 x 1.50mm² conductor size

	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 73	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
70009110250	Approvals pending (same approvals as a C13)	16A/250 VAC	70°C	BLK	2.5m	TJ3	X02	Connector lock, 85910051 page 70
86395300	Approvals pending (same approvals as a C13)	16A/250 VAC	70°C	BLK	2.5m	TJ3	X03	Connector lock, 85910051 page 70
86295310	Approvals pending (same approvals as a C13)	16A/250 VAC	70°C	BLK	2.5m	TJ3	X06	Connector lock, 85910051 page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x1.50mm²	H05VVF3G1.5	INT'L*	30/0.25mm	<HAR>	7.4-9.4mm

North American power cords for use at 20A/250VAC

3 x 12AWG conductor size

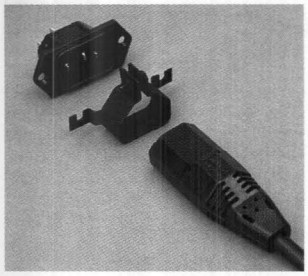
	Approvals	Current/ Voltage Rating	Max. Cable Temp.	Color	Length	Plug & End Termination Specifications: Plug p. 73	Plug & End Termination Specifications: End Termination p. 72-73	Recommended connector lock or strain relief
70025110250	UL, CSA	20A/250 VAC	60°C	BLK	2.5m	TJ3	X02	Connector lock, 85910051 page 70
86295200	UL, CSA	20A/250 VAC	60°C	BLK	2.5m	TJ3	X03	Connector lock, 85910051 page 70
86295210	UL, CSA	20A/250 VAC	60°C	BLK	2.5m	TJ3	X06	Connector lock, 85910051 page 70

CORDAGE SPECIFICATIONS	Conductor Size	Description	Wiring	Typ. Stranding	Marking†	Nom. O.D.
	3x12AWG	SJT	N.A.*	65/30	—	11.1mm

* Wiring Code: INT'L—International: brown (line), blue (neutral), green/yellow (ground) N.A. — North American: black (line), white (neutral), green (ground)

† Marking: International harmonized cordage may be marked on outer jacket, inner conductor jacket, or an identifying tracer thread can be incorporated with conductors.

Cordset Connector Locks



Connector locks secure power cord to IEC 60320* power inlet to prevent accidental power interruption; cordsets can be easily removed without disrupting the connector lock. Each cordset connector lock is designed for the molding of a specific cordset connector style (see chart on next page for a listing). The connector locks can be used only with the screw-mounted power inlet models.

Assembly: Attach cordset connector lock to the inlet with mounting screws (specify a slightly longer mounting screw to accommodate the connector lock), then tighten the connector lock around cordset connector end by turning the captive screw on the connector lock. Connector end can be removed by loosening the screw on the lock without affecting the inlet and connector lock mounting. See drawing on page 71 for more details.

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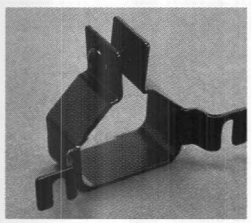
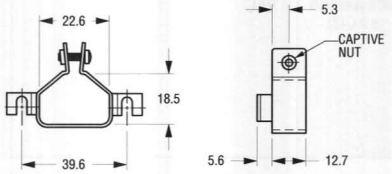
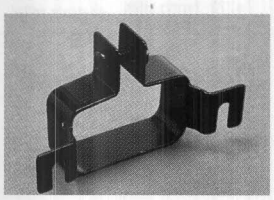
For 10/15A Rated Inlets & Cordsets



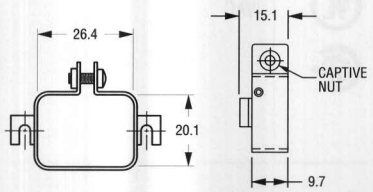
Part Number: 85910010



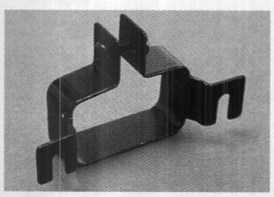
For use with TC1 connector.



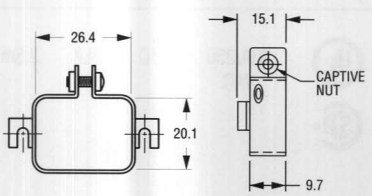
Part Number: 85910070



For use with TO2, TO3, TO5, TO6, and, TO7 connectors. North American applications only.

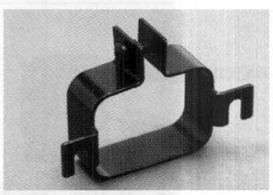


Part Number: 85910071

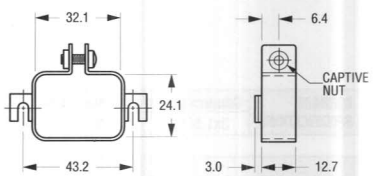


For use with TO2, TO3, TO5, TO6, and, TO7 connectors. International applications only.

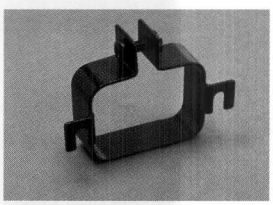
For 16/20A Rated Inlet, Cordsets & Cable Connector



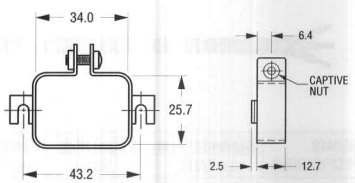
Part Number: 85910051



For use with X02, X03, and, X06 connectors.



Part Number: 85910040



For use with 83011380 rewireable connectors.

Dimensions in mm

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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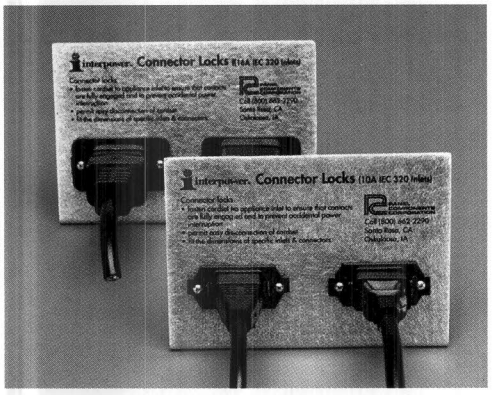

10A
Part Number: 83010020
16-20A
Part Number: 83010030

For a free sample panel...

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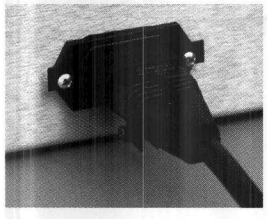
Installation instructions



Inlet, cordset and connector lock assembly

1. To insure proper alignment of the clamp with the connector, loosen the two mounting screws on the sides of the power inlet.
2. Slip the connector lock under the mounting screws and leave the mounting screws loose.
3. Insert the cordset through the lock into the inlet. Be sure that it is pushed completely into the inlet. This step is very important for your safety—a partially mated connector could cause a fire. Once the connector has been properly seated, the connector lock will keep it there in the future and assure your safety.
4. Tighten the locking screw on the connector lock so that the clamp firmly grips the connector on the cordset.
5. Tighten the two mounting screws on the sides of the inlet. The lock is now centered on the connector, so that cordsets may be easily removed and inserted in the future.

Removing the cordset

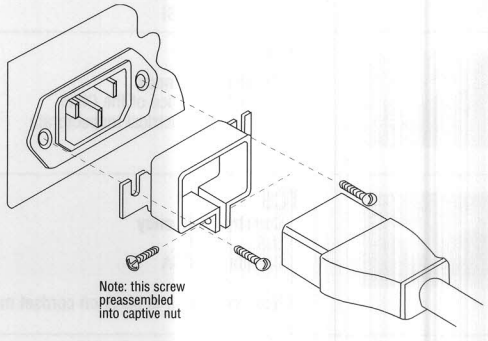
Note: After the installation has been done once, it is not necessary to adjust the side mounting screws again.

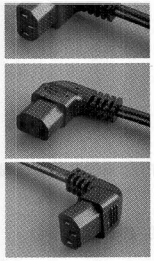
1. Loosen the locking screw on the cordset connector lock.
2. Remove the cordset.

Locking the cordset

Note: After the installation has been done once, it is not necessary to adjust the side mounting screws again.

1. Insert the cordset through the lock into the connector. Be sure that it is pushed completely into the connector.
2. Tighten the locking screw on the cordset connector lock so that the lock firmly grips the cordset.

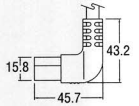




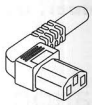
	Switzerland	ETSI
	Australia	OVE
	U.K.	ASTA
T06	Australia	Department of Fair Trading

T07

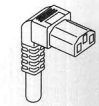
T05 & T07

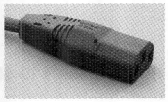


T06



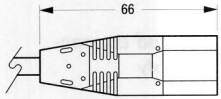
T07

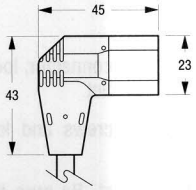


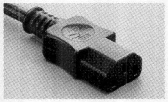


TC1 and TC2

Country	Agency
Australia	Department of Fair Trading
Austria	OVE
Belgium	CEBEC
Denmark	DEMKO
Finland	FIMKO
France	LCIE
Italy	IMQ
Germany	VDE
Netherlands	KEMA
Norway	NEMKO
Sweden	SEMKO
Switzerland	ETSI
U.K.	BSI

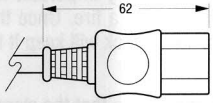






TC3

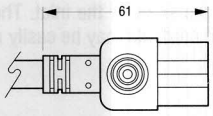
Country	Agency
Australia	Office of the Chief Electrical Inspectorate



TC5

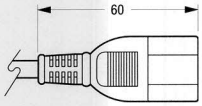
Country	Agency
U.S.	UL
Canada	CSA

Note: connector is black on cordset model 86610100



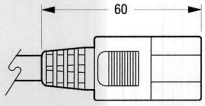
TC6

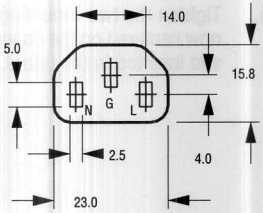
Country	Agency
Japan	Dentori



TC7

Country	Agency
Japan	Dentori





MATING INLETS & MULTI-FUNCTION MODULES

See specification charts, pages 170-171

Dimensions in mm

** As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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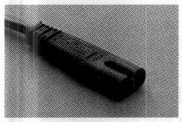
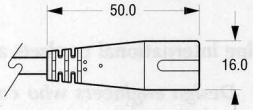
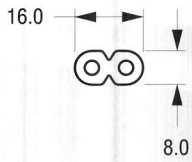
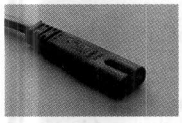
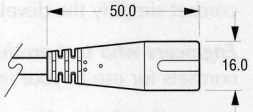
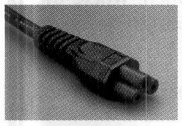
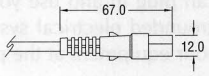
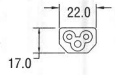
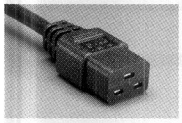
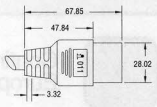
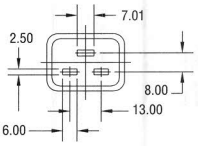
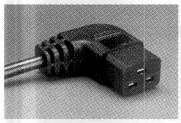
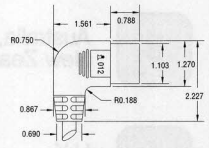
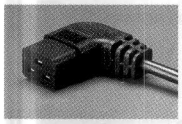
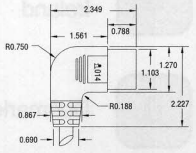
Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360

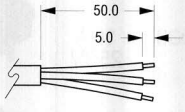
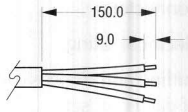
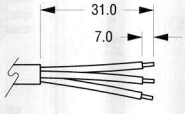
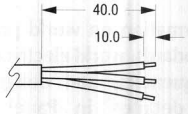
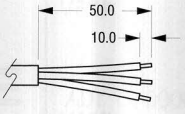
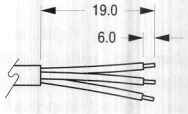
Connectors on cordsets rated 2.5A/250VAC • IEC 60320* • Material: PVC

Connector approvals	Drawings	FACE VIEW
 **TD1** **Country** / **Agency** Australia — Department of Fair Trading Germany — VDE Sweden — SEMKO U.K. — BSI		
 **TD2** **Country** / **Agency** U.S. — UL Canada — CSA Japan — Dentori		
 **TH1** **Country** / **Agency** U.S. — UL Canada — CSA		

Connectors on cordsets rated 16-20A/250VAC • IEC 60320* Standard Sheet C19 • Material: PVC

Connector approvals	Drawings	FACE VIEW
 **X02** **Country** / **Agency** U.S. — UL Canada — CSA International — Pending		
 **X03** **Country** / **Agency** U.S. — UL Canada — CSA International — Pending		
 **X06** **Country** / **Agency** U.S. — UL Canada — CSA International — Pending		

Standard Jacket & Conductor Strips on Cords

Strip Type	Drawings	Strip Type	Drawings
TJ1 **Jacket stripped 50mm; conductors 5mm**		**TJ4** **Jacket stripped 150mm; conductors 9mm**	
TJ2 **Jacket stripped 31mm; conductors 7mm**		**TJ5** **Jacket stripped 40mm; conductors 10mm**	
TJ3 **Jacket stripped 50mm; conductors 10mm**		**TJ6** **Jacket stripped 19mm; conductors 6mm**	

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Designer's Kit of International Cordsets

Simplify your power systems design with sample kits from Panel Components Corporation.

86599011: Interpower™ Designer's Kit of International Cordsets
Size: 483mm x 394mm x 102mm
Weight: approx. 4kg
Delivery: from stock

Features:

- **Nine cordsets with the most common international plugs; each cordset is terminated with the IEC 60320* appliance connector, a common standard in the industrialized world.**
- **Complete specs on each cordset for use in developing your purchasing specifications. Each spec includes:**
  1) a general description of the cordset;
  2) applicable international standards;
  3) required safety agency approvals;
  4) mechanical specifications on cordage, plugs, and IEC 60320* connectors;
  5) electrical rating;
  6) outline and dimensioned drawings of each cordset.
- **Information on world plug and socket standards, world electrical voltages and frequencies, and design information as detailed in Panel Components Corporation's publications.**

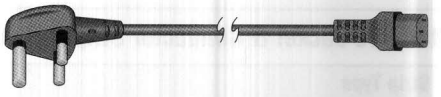
† We reserve the right to substitute part numbers to reflect product changes; substitution is sometimes necessary to update product approvals or to change manufacturers to improve delivery times.

Nine international cordsets are packaged in a convenient, portable box for use by:

- ***Design engineers who configure products for export...*** use these cordsets and the design information included in the kit to configure the electrical system of your product. Complete specifications on each cordset simplify the development of your purchasing specifications.
- ***Engineers who test products prior to shipment overseas...*** the kit conveniently organizes international cordsets for use in your test and burn-in lab.
- ***International travelers who carry and use equipment which must be properly plugged in and grounded...*** the nine cordsets in this kit represent the major plug standards used in the world today. You can plug in and use your computer (or other electrical equipment) almost anywhere where there is a grounded electrical system. (**Note:** World voltages and frequencies vary from country to country; set your equipment at the proper voltage and frequency before operation!)

(Cords and cordsets are also sold individually. Call our Customer Service Department at (800) 662-2290 for further information.)

The Designer's Kit includes these cordsets:

	Country	Part No.†	Rating	
A	Continental Europe	86230030	10A 250V	
B	Australia, New Zealand	86210030	10A 250V	
C	U.K. Ireland	86397010	10A 250V	
D	Denmark	86391000	10A 250V	
E	India, South Africa	86392000	10A 250V	
F	Israel	86393000	10A 250V	
G	Italy	86394000	10A 250V	
H	N.A.	70401020244	10A 125V	
I	Switzerland	86396000	10A 250V	

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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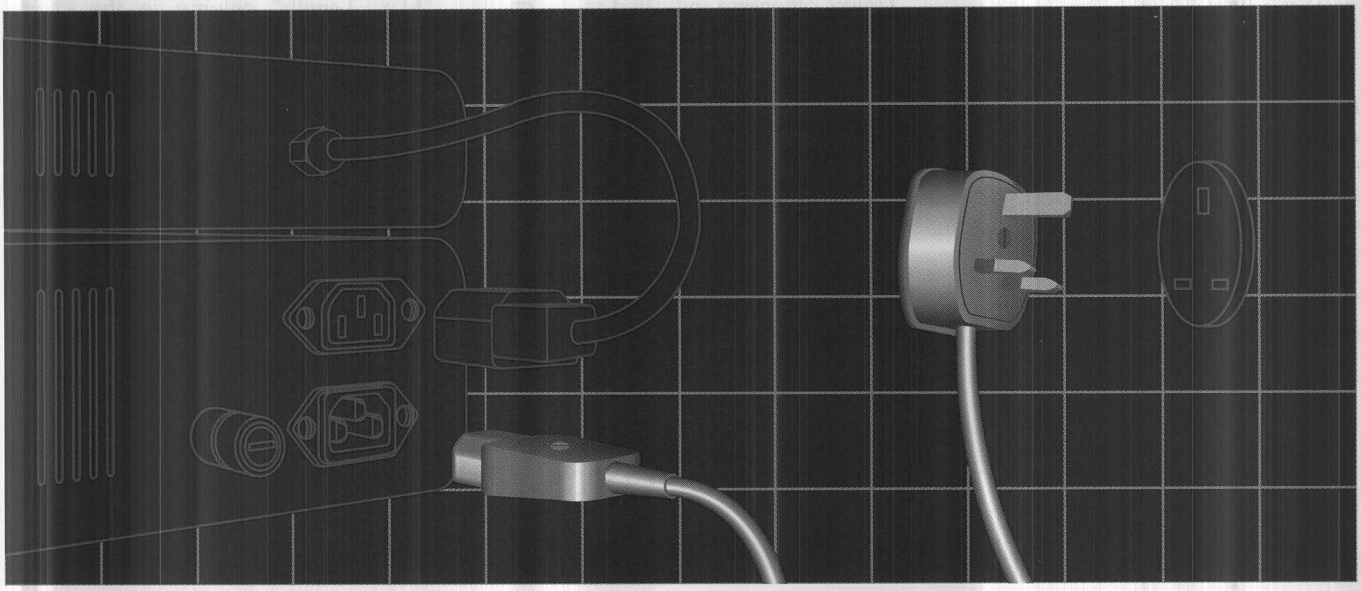
Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360

"Made to Order" Cord Assemblies



Approved Cord Assemblies

In most cases, power cords and cordsets assembled in our shop meet the requirements of national safety agencies. Compliance with these requirements falls into the following three levels:

1. Third-world countries don't enforce standards. Cord assemblies should employ components compatible with prevalent usage in a given country. Assembly should be done in accordance with good standard practice.
2. Most industrialized countries have written standards which require the use of approved components. The standards may also indicate some preferred assembly and testing methods.
3. In North America, UL and CSA require both the use of listed and certified components and periodic on-site inspections of the assembly operation to verify that approved procedures are being followed.

Where possible, we have chosen components which meet the three levels of compliance listed above. In addition, we follow standard assembly and testing practices and guidelines which satisfy all three levels. Finally, we can produce detachable and non-detachable cords per UL 817 and CSA 22.2 No. 21-M1984. When an assembly meets all agency requirements, we can mark the packaging with UL and CSA labels.

Made-to-Order Assemblies

This section is an extension of the cord and cordsets section (pages 15-74) of this catalog. The standards for cords, plugs, sockets, power inlets, and power outlets vary by nation. The information in the cordsets section is needed to make good selections in this section, but it is not repeated here. Additional information can be found in the plug and socket section beginning on page 87, and the power module and inlet section which begins on page 169.

Advantages of Standard Cords

The cords in the International/North American Cords and Cordsets section are the best value; use them when you can.

They offer several advantages over those in this section: First, they are less expensive than made-to-order cords. Second, we try to maintain a good stock of the standard products so that you won't need to wait so long for your orders to be filled. Third, they are made with molded-on plugs and connectors. This makes them better for at least three reasons:

1. They can use crimp connections which are more secure and reliable than screw terminals.
2. Because these connections are surrounded by PVC, they are just about tamper-proof
3. Last, they look clean and solid.

When you can't find just what you need among our standard cords, this chapter will help you specify made-to-order cords and cordsets that meet your exact needs. Here you will find more options from which to choose. Cords of any reasonable length can be made. In many cases, higher current ratings are available. In addition, we can prepare power cord ends in many ways (special strip lengths, barrel crimp, ring and flag terminals) to help you hook them up to your other primary components.

Standard Components

We use a group of standard parts to make our made-to-order cords because this helps us do a better job for you. We keep these parts in stock, which allows us to turn your orders around quickly, giving you a high level of service. Also, since our assembly people work with the same parts and tooling often, they can make consistently high quality cords for you.

Need a non-standard cord or cordset? Just call...

1 We have simplified the process for specifying a made to order cord or cordset. The first step: call us!

Tammy Finch

Jane Lewachowicz

Wendy Meyer

Chris Novak

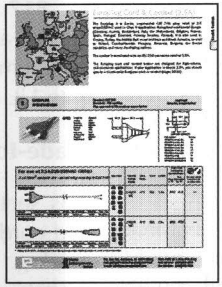
Judy Nunnikhoven

Virginia Pierson

Shannon Reed

Heather Steinlicht

Kathy Whitehead



2 The first thing we'll do is make sure a standard cord is not available. A standard cord will be less expensive and will ship faster.

3 If we can't find a suitable cord from stock, we will suggest the components of a made-to-order assembly from the options shown on pages 80-85.

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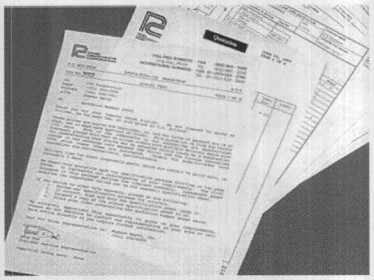
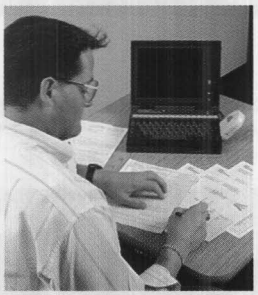
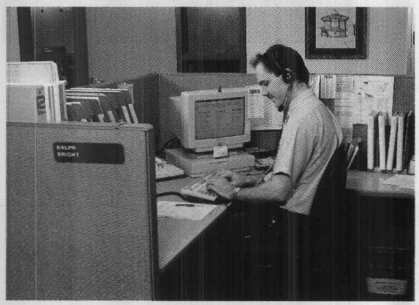
Fax toll-free: (800) 645-5360





5

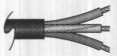
Please review the specifications. If the assembly as outlined in the specs will meet your requirements, sign the assembly specification sheet and fax it back to us along with your purchase order number.



6 Then we'll enter your order! A work order will be prepared from the assembly specification sheet and a pick list will be generated for parts.

8

Outer jacket strip...



Work begins on your order.

9

Conductor strip

10

Plug assembly

High power plug/connector

11

Connector assembly

Special end terminations

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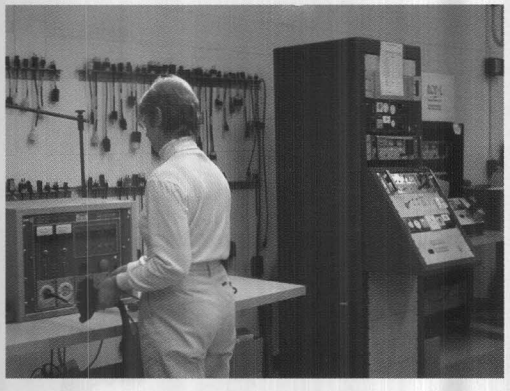


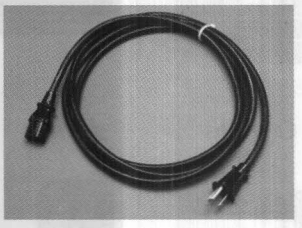
12

All cords are 100% tested

Panel Components Corporation's made-to-order cord testing program has been designed to meet or exceed the requirements of UL Standard 817. Every cord is checked for continuity, polarity, opens, and shorts. Each cord must pass an additional ground integrity test. This test checks that the safety ground wire strands and connections are sound. While it conducts 25A for one second, there must not be a significant rise in resistance. Finally, each cord must pass a dielectric strength test of 2500VAC for a duration of at least one second. In addition to the above 100% electrical test, samples from each order must pass a strain relief test. The assembled cords are subjected to a force of 13.5 kilograms for one minute. After this, a visual inspection must show that the cordage has not slipped in the connector strain relief. Records are kept for all tested cords.

13

Hanking, coiling, bagging, bundling
(see page 86)



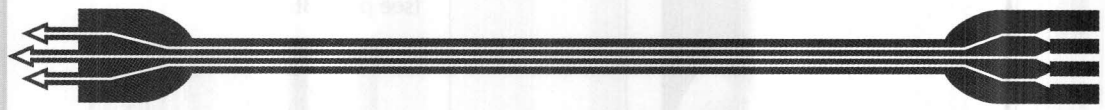
Optional: labeling
(see page 86 for other options)

14

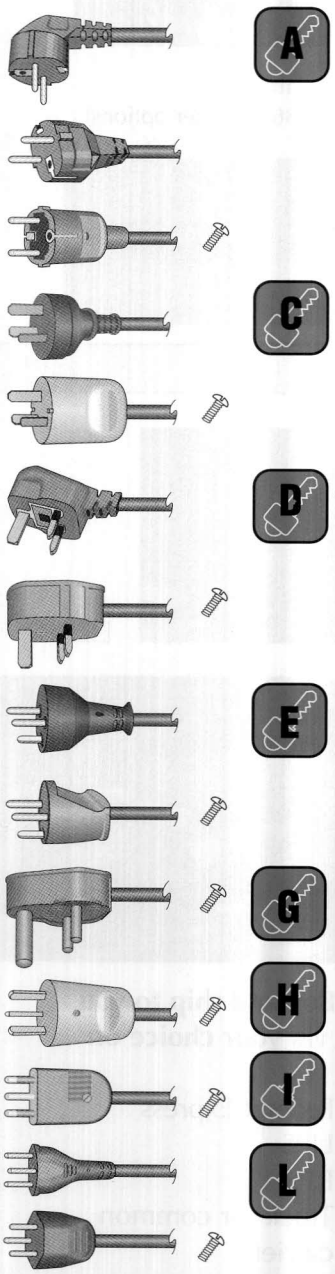
Box and ship to you via your choice of:

- Federal Express
- UPS
- RPS
- Truck or common carrier

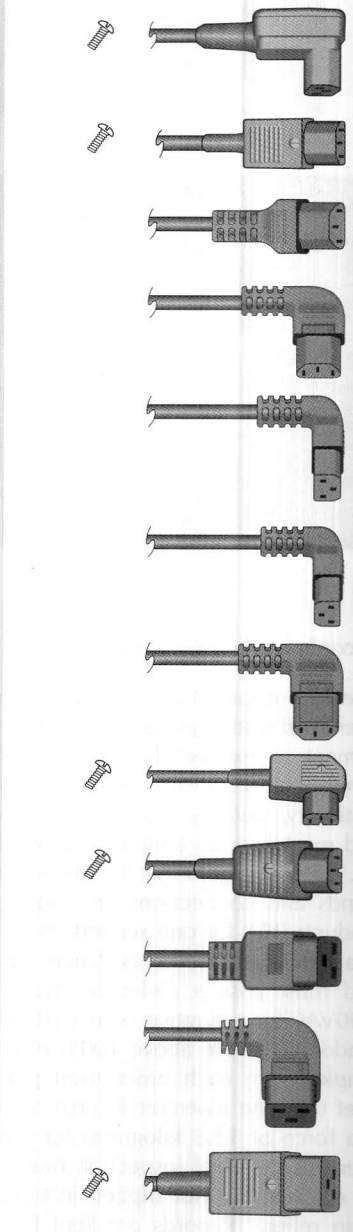
Made-to-order
International Cordsets



Plug Options



Connector Options



= Hand Assembled

Note that not all options shown above are available.
Call us and we will guide you toward an assembly that meets your requirements.

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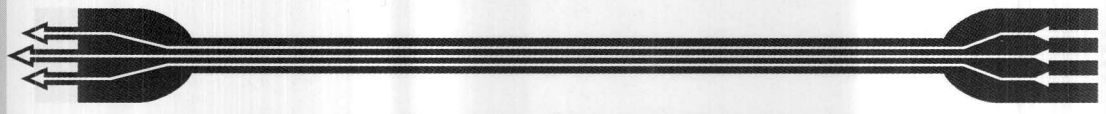
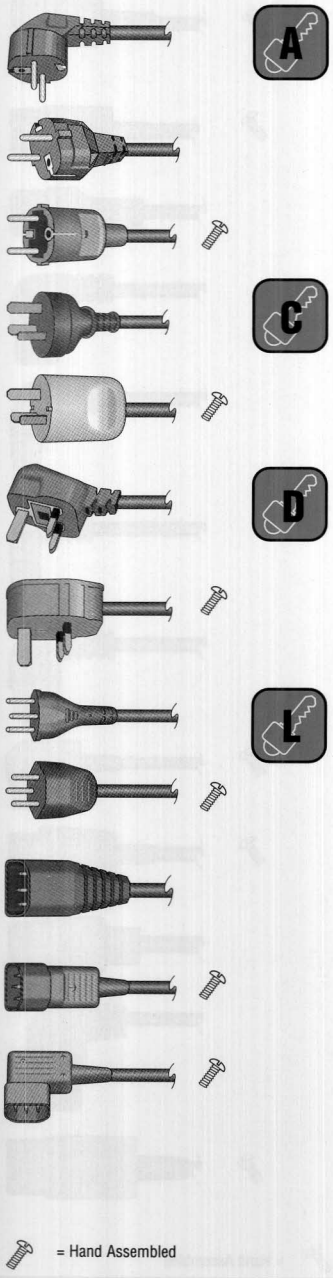
Fax toll-free: (800) 645-5360

Made-to-order
International Extension & Accessory Jumper Cordsets

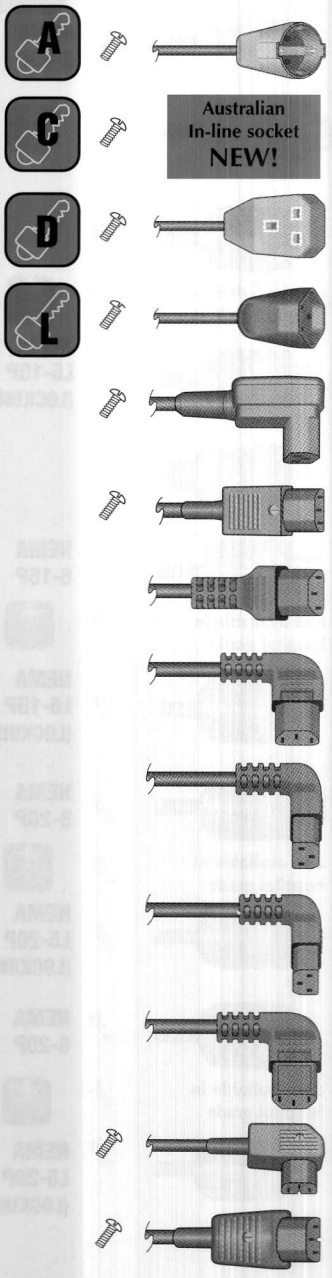


Plug Options



= Hand Assembled

Connector Options



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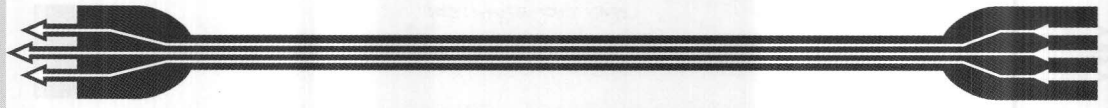
Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360

Made-to-order
North American Cordsets

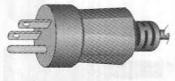


Plug Options

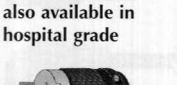
NEMA 5-15P

also available in hospital grade

NEMA L5-15P (LOCKING)



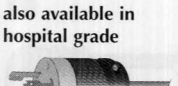
NEMA 6-15P



also available in hospital grade

NEMA L6-15P (LOCKING)

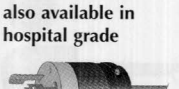
NEMA 5-20P



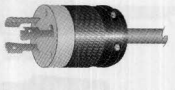
also available in hospital grade

NEMA L5-20P (LOCKING)

NEMA 6-20P

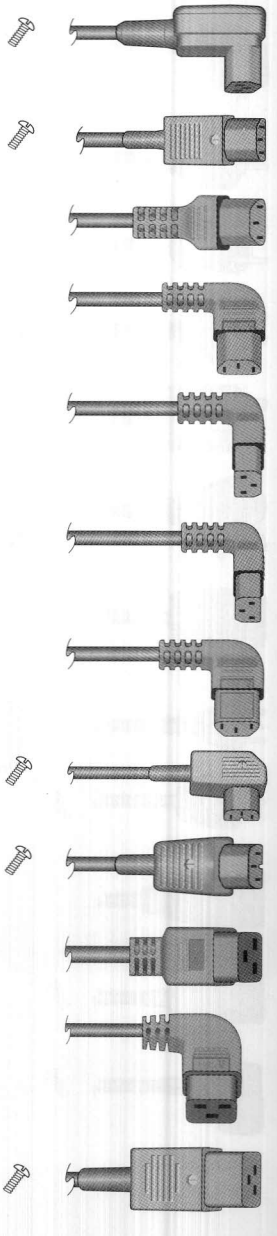


also available in hospital grade



NEMA L6-20P (LOCKING)

Connector Options



= Hand Assembled

Note that not all options shown above are available.
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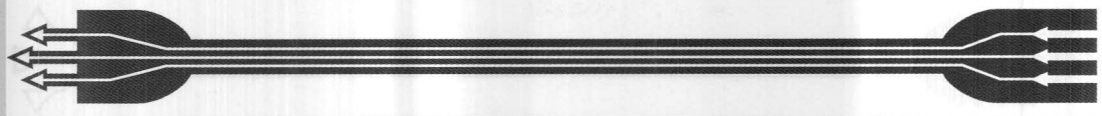
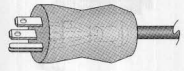
Made-to-order

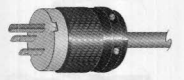
North American Extension Cords & Accessory Power

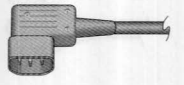


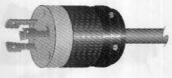
Plug Options

NEMA 5-15P

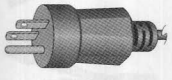




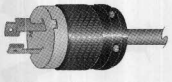




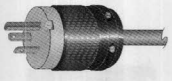
NEMA L5-15P (LOCKING)



NEMA 6-15P



NEMA L6-15P (LOCKING)



NEMA 5-20P

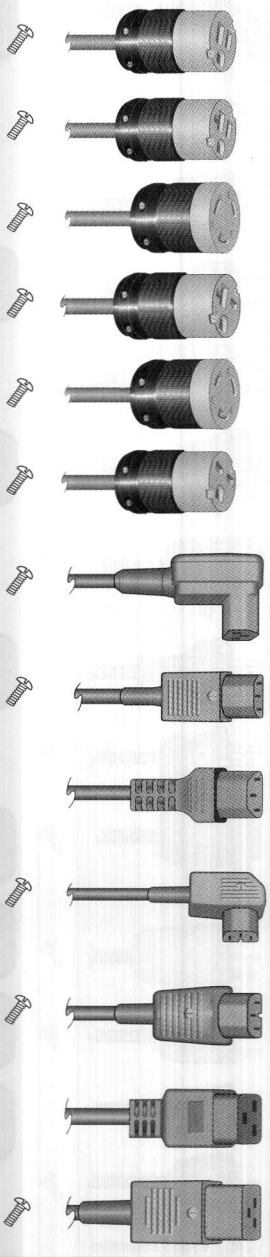
NEMA L5-20P (LOCKING)

NEMA 6-20P

NEMA L6-20P (LOCKING)

= Hand Assembled

Connector Options



Note that not all options shown above are available.
Call us and we will guide you toward an assembly that meets your requirements.

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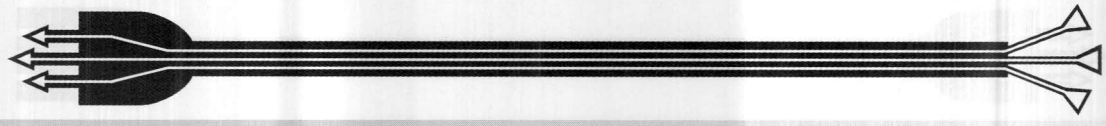
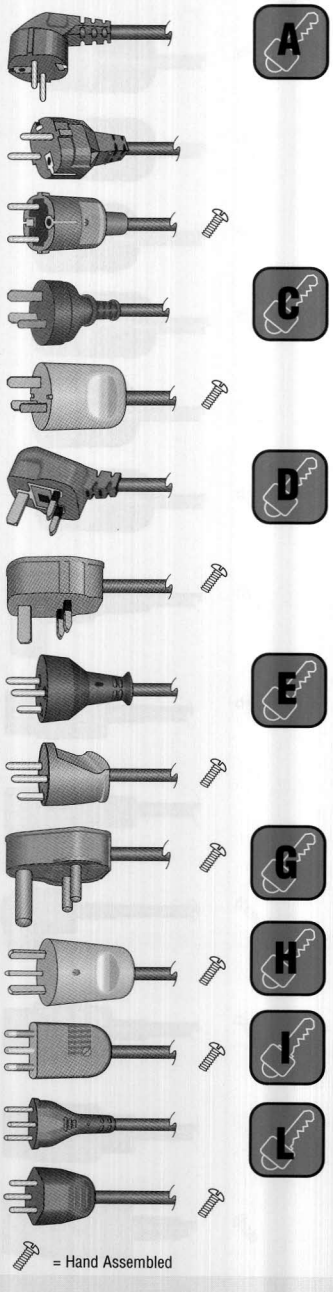
Made-to-order International Cords

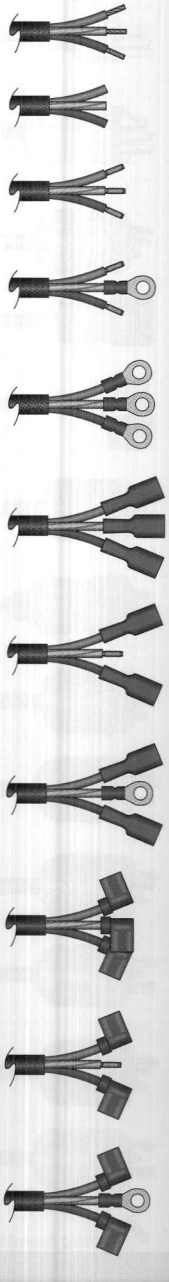


Plug Options



= Hand Assembled

End Termination Options



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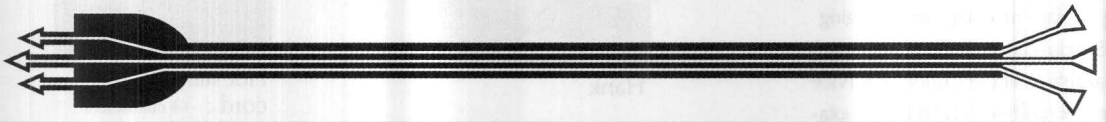
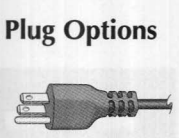
Made-to-order
North American Cords



Plug Options



NEMA 5-15P

also available in hospital grade

NEMA L5-15P (LOCKING)

NEMA 6-15P

also available in hospital grade

NEMA L6-15P (LOCKING)

NEMA 5-20P

also available in hospital grade

NEMA L5-20P (LOCKING)

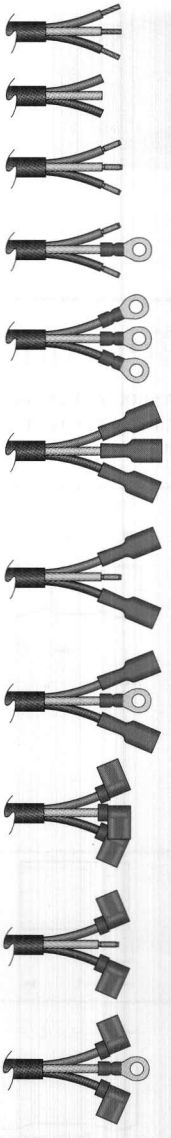
NEMA 6-20P

also available in hospital grade

NEMA L6-20P (LOCKING)

= Hand Assembled

End Termination Options



NOTE: All configurations shown available with North American or internationally color coded cable. UL/CSA assembly services available.

Note that not all options shown above are available.
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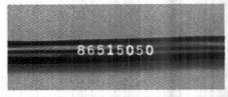
Cord Marking & Packaging Services

Call for a quotation on these services.

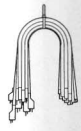
Special delivery? No problem. We offer the following cordage marking and packaging services. Special carton marking or labeling is also available. Call our Customer Service Department at (800) 662-2290 for a quotation on these services.

Hank



Hot stamping on cord : 14 characters

Coil



Cords bundled:
Standard — 25 to a bundle

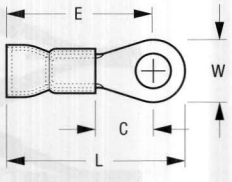
Cordage individually bagged and labeled

Label wrapped around cord:
Label size: 25.4mm x 50.8mm

Crimp Terminal Dimensions

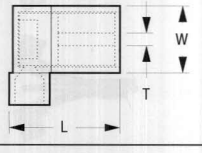
These terminals are not sold separately; the crimp terminal dimensions are for use in specifying the made-to-order assemblies shown on pages 84-85. IEC 60950*/EN 60 950 requires that crimp terminals be double crimped (crimping of conductor wires and crimping to insulation) to ensure the connection. Assemblies with the crimp terminals shown at right meet these double-securing requirements.

Ring Terminals



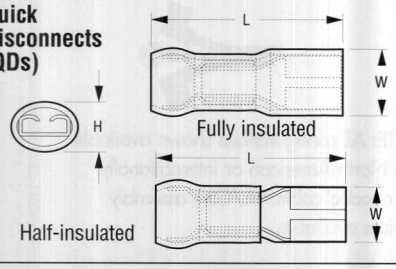
Part Number	No. Amer. Wire Size	Metric Wire Size	Color	Stud Size	W	C	E	L
55010351	16-22AWG	0.75-1.0mm²	Red	8	7.87	8.13	20.07	23.87
55010470	16-22AWG	0.75-1.0mm²	Red	10	7.87	8.13	20.07	23.87
55010751	14-16AWG	1.5-2.5mm²	yel/blk	1/4"	12.19	9.14	24.89	30.99
55010762	14-16AWG	1.5-2.5mm²	yel/blk	5/16"	12.19	9.14	24.89	30.99
55010951	14-16AWG	1.5-2.5mm²	blue	10	7.87	7.11	19.05	23.11
55010980	16-22AWG	0.75-1.0mm²	Red	6	5.59	4.06	16.00	18.80
55010990	14-16AWG	1.5-2.5mm²	Blue	6	6.35	4.06	15.75	18.80
55011000	14-16AWG	1.5-2.5mm²	Blue	8	7.87	7.11	19.05	23.11
55011010	10-12AWG	4.0-6.0mm²	Yellow	8	7.11	6.86	22.61	26.16
55011020	10-12AWG	4.0-6.0mm²	Yellow	1/4"	13.21	11.94	27.69	34.29
55011030	10-12AWG	4.0-6.0mm²	Yellow	6	7.87	6.86	22.35	26.41
55011040	10-12AWG	4.0-6.0mm²	Yellow	10	9.40	7.11	22.86	27.69

Flag Quick Disconnects (QDs)



Part Number	No. Amer. Wire Size	Metric Wire Size	Insulated	Color	NEMA Tab	W	T	L
55010510	14-16AWG	1.5-2.5mm²	yes	Blue	0.81x6.35	7.62	1.65	15.88
55010730	18-22AWG	0.75-1.0mm²	yes	Red	0.81x6.35	7.62	1.65	15.52

Quick Disconnects (QDs)



Part Number	No. Amer. Wire Size	Metric Wire Size	Color	Insul.	NEMA Tab	W	L	H
55010390	18-22AWG	0.75-1.0mm²	Red	Full	.032x.187	8.13	23.37	4.83
55010400	18-22AWG	0.75-1.0mm²	Red	Full	.032x.250	9.40	24.13	5.33
55010410	14-16AWG	1.5-2.5mm²	Blue	Full	.032x.187	8.13	23.37	5.08
55010420	14-16AWG	1.5-2.5mm²	Blue	Full	.032x.250	9.65	24.13	5.59
55010430	10-12AWG	4.0-6.0mm²	Yellow	Full	.032x.250	9.14	27.18	8.38
55010930	18-22AWG	0.75-1.0mm²	Red	Full	.020x.110	5.33	18.54	3.81
55010931	18-22AWG	0.75-1.0mm²	Red	Half	.032x.187	5.92	21.84	

Dimensions in mm

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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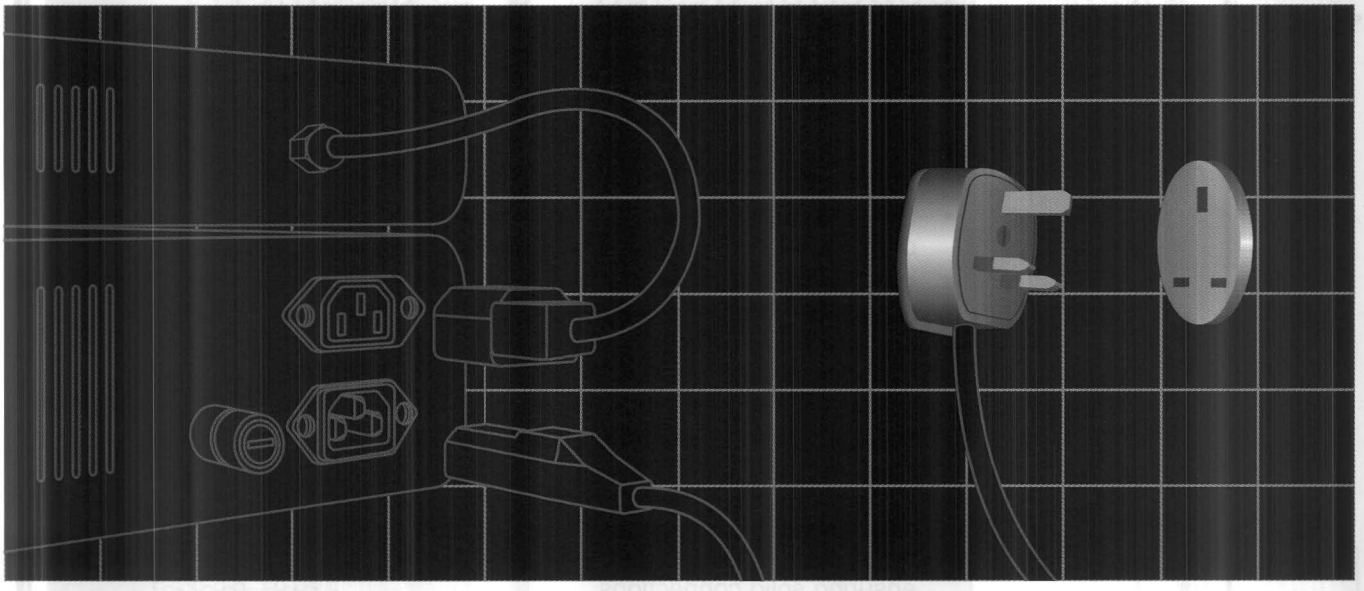
Plugs & Sockets



Designing for export? We make it easy with North American and international plugs and sockets from Panel Components Corporation.

International Sockets

Use international sockets and socket strips to test or burn-in electrical and electronic equipment that will be exported with foreign power cords and cordsets. This allows testing of the equipment, complete with the power cord, in exactly the same manner that your overseas customer will use it.

Sockets for both international and North American applications are covered in this section. Socket strips can be found in the section beginning on page 229. The International Socket Strip and the International Power Source, for use in test or burn-in setups, are covered on pages 230 and 239 respectively.

International sockets can also be used as convenience power outlets or in conjunction with power distribution devices in large electronic systems.* For example, computer systems occupying one or more racks may include an appropriate international convenience power outlet for use by a service technician. Large communications or military electronics systems can utilize power controllers or distribution devices equipped with international sockets that are appropriate for the country in which they will be used.

International Plugs

Rewirable international plugs are used primarily when it is advantageous to build a special-purpose power cord, cordset, or extension cord that is not available in the quantity required as a molded ("standard") product; for example, a cord longer than our standard 2.5 meter length, a cord or cordset with a higher rating than we normally stock in a molded version, or a non-standard cordage jacket color or conductor size. These requirements are often best satisfied with a special cord or cordset that is assembled from standard cordage and rewirable plugs and connectors.

The minimum order quantity on a non-standard molded cord assembly may range from 1000 pieces or more, depending on the design. However, a cord assembled with rewirable components can be produced in quantities as small as one piece.

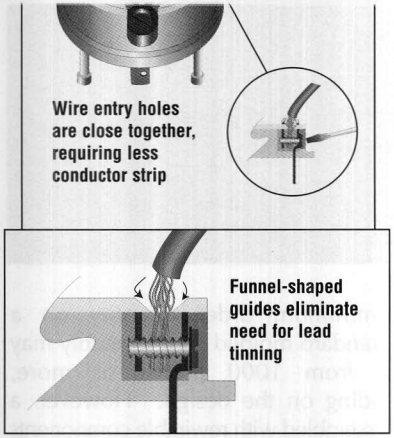
The major international plug and socket pin patterns are described in more detail in the International Cord & Cordset section of this catalog; see pages 16-20. For a guide to where the plugs and sockets in this section are used, see the fold-out poster in the Designer's Reference Section.

Custom Cord Preparation Services

Panel Components Corporation's in-house UL, CSA assembly services can prepare special cords, cordsets and extension cords using components described in this catalog. Our capabilities are described in the "Made-to-Order" Cord Assemblies section (pages 75-86).

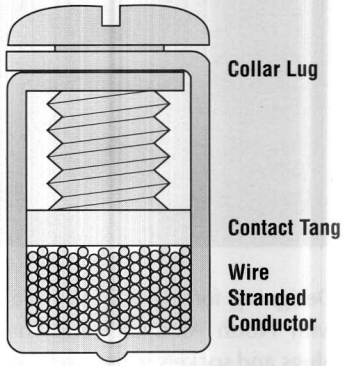
For additional specifying assistance, please contact our Customer Service Department, toll-free, at the numbers below.

* Note, however, if a convenience outlet is accessible to your overseas customer, you may be required to use the accessory power distribution system based on the IEC 60320 connector standard; see page 229 for more information.



end-users in the field. Terminal screws are open for quick assembly, and terminals are clearly marked when necessary.

- **Unique locking assembly** (see illustration at right) ensures that the terminal screw will remain locked in place even with heat-cycling and vibration. Terminal screw compresses wires securely underneath a contact tang, ensuring solid connections.
- **Seal keeps dust out** of wiring chamber.
- **Internal cord clamp** cannot be broken or accidentally loosened.
- Cord clamp accommodates a **large range of cordage diameters**.
- Housings are made of nylon material and are **very shock-absorbent.**



Materials & Specifications

Plugs & Connectors

Dielectric Withstand Voltage:
>3,000V; heat rise max. 30°C after 100 cycles of 150% of rated current. Current interrupting.
Temperature Rating:
125°C UL listed for continuous use
UL Flammability Index:
UL 94V-2
Front & Rear Housings:
Nylon
Cord Clamp:
Nylon
Accommodates Wire Size:
No. 18-10 *(No. 16-10 on 20A & 30A)*
Terminals & Contacts:
Locking, lug-type *(Clamp-type on 20A & 30A locking models)*
Terminal Screws:
No. 8 solid brass *(No. 10 solid brass on 20A & 30A locking models).*
Combo head *(No. 2 Phillips/ slot.)*
Terminal Cover:
Clear polycarbonate

Receptacles

Dielectric Withstand Voltage:
>3,000V; heat rise max. 30°C after 100 cycles of 150% of rated current. Current interrupting.
Temperature Rating:
130°C UL listed for continuous use
UL Flammability Index:
UL 94V-0
Face & Housing:
Glass-filled Nylon
Mounting Straps, Rivets, & Grounding Strip:
Solid Brass
Terminal Clamps & Screws:
No. 8 solid brass *(No. 10 solid brass on 20A & 30A locking models)*
Terminals & Contacts:
Clamp-type terminals. Rivetless, one-piece copper alloy, double-wipe contacts eliminate joint resistance.

Dust Resistant Inlets

Dielectric Withstand Voltage:
>3,000V; heat rise max. 30°C after 100 cycles of 150% of rated current. Current interrupting.
UL Flammability Index:
UL 94V-2
Flange & Terminal:
Nylon
Terminal Cover:
Clear Polycarbonate
Boot, Seal Ring, & Cap:
PVC Nitrile
Terminals & Contacts:
Solid Brass

Flanged Inlets/Outlets

Dielectric Withstand Voltage:
>3,000V; heat rise max. 30°C after 100 cycles of 150% of rated current. Current interrupting.
Flange and Rear Housings:
Nylon
Blades (Inlet):
Solid Brass
Contacts (Outlet):
Solid Brass
Terminal Screws:
Solid Brass
Terminal Clamps:
Solid Brass
Terminal Cover:
Clear polycarbonate

PANEL COMPONENTS CORPORATION
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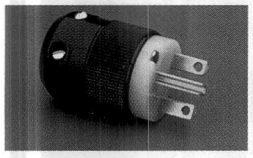
North American Plugs and Sockets



The plugs, connectors, and receptacles in this catalog are described in standards published by NEMA (National Electrical Manufacturer's Association) in the United States and by CSA (Canadian Standards Association) in Canada. The standards identify unique pin and receptacle configurations based on amperage and voltage ratings. Both straight blade and locking configurations are included in the standards. The NEMA 5-15 straight blade configuration is used most often in the U.S. and Canada. *(See the chart below for NEMA configurations offered in this catalog.)*

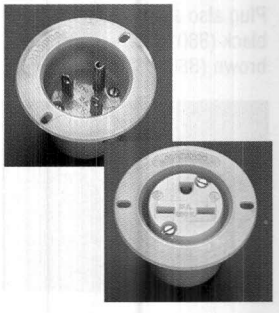
Dust resistant inlets and outlets protect sensitive electronics

If you require a power connection above 16A/125VAC which can also be used internationally, consider designing your product with IEC 60309* pin and sleeve plugs and connectors. For more information see our section in the catalog on IEC 60309* connectors on page 117.

If your product will be used in a dusty environment, consider specifying our **dust-resistant inlets**. An extra gasket seals the inlet's flange against the equipment panel.

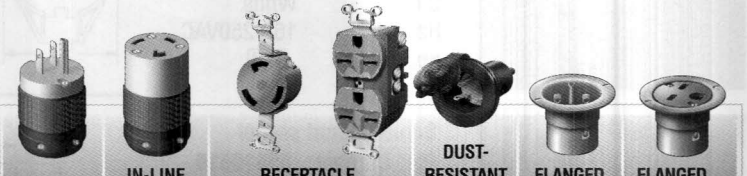
If there is only a small space behind your panel to mount a plug or socket, take a close look at our line of **flanged inlets and outlets**. A flanged nylon housing allows mounting in a panel from the front of the panel, without access from the rear.

Our North American plugs, connectors, and receptacles have been designed and tested for grounding reliability, assembly integrity, strength, and durability. They meet or exceed the requirements of UL Standard 498 (Attachment Plugs and Receptacles) for abrupt plug removal; ground pin retention; fault current; terminal strength; ground contact temperature and resistance; assembly security; cord grip strain relief and cord pull; and various durability and impact tests of the material.



Use flanged inlets and outlets for front-mounting applications

Plugs and receptacles by rating



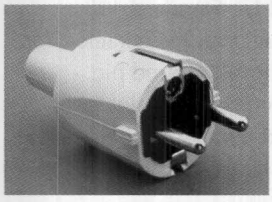
RATING AMPS	VOLTS	NEMA CONFIGURATION		STYLE	SEE	PLUG	IN-LINE CONNECTOR	RECEPTACLE SINGLE	RECEPTACLE DUPLEX	DUST-RESISTANT INLET	FLANGED INLET	FLANGED OUTLET
15A	125VAC		5-15	Straight blade	Page 98	88030100	88030110	88031010	88030070	88031100	88031040	88031030
			5-15	Straight blade, **Hospital**	Page 108	88030270	88030280	88030290	—	—	—	—
			L5-15	Locking	Page 99	88030240	88030250	88031210	88031220	88031140	88030480	88030490
15A	250VAC		6-15	Straight blade	Page 100	88030200	88030210	88030610	88030590	88031110	88030440	88030450
			6-15	Straight blade, **Hospital**	Page 108	88030370	88030380	—	—	—	—	—
			L6-15	Locking	Page 101	88030220	88030230	88030630	88030640	88031150	88030650	88030660
20A	125VAC		5-20	Straight blade	Page 102	88030120	88030130	88030080	88030430	88031120	88030460	88030330
			5-20	Straight blade, **Hospital**	Page 109	88030390	88030400	88030580	—	—	—	—
			L5-20	Locking	Page 103	88030140	88030150	88030300	—	—	88030500	88030510
20A	250VAC		6-20	Straight blade	Page 104	88030180	88030190	88030620	88030600	88031130	88030470	88030030
			6-20	Straight blade, **Hospital**	Page 109	88030410	88030420	—	—	—	—	—
			L6-20	Locking	Page 105	88030160	88030170	88031080	—	—	88030090	88030530
30A	125VAC		L5-30	Locking	Page 106	88031070	88031160	88031170	—	—	88030540	88030550
30A	250VAC		L6-30	Locking	Page 107	88030310	88030320	88031180	—	—	88030560	88030040

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Continental European Plugs & Sockets

For use in Germany, Austria, Finland, the Netherlands, Norway, Sweden, France/Belgium, and other countries utilizing the CEE 7 standard.
(Note: Sweden requires use of socket with separate mounting bracket like 88010500. France/Belgium require use of different socket types, shown on page 95.)

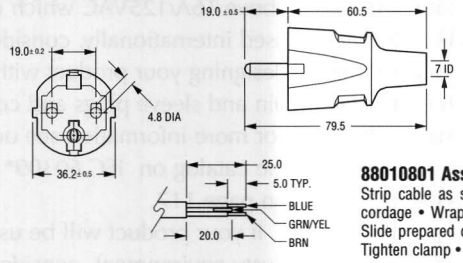
Continental European Plugs & Sockets



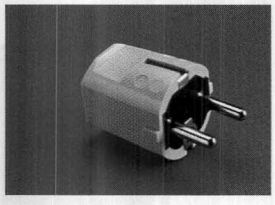
Plug also available in black (88010920) or brown (88010820)

Plug with strain relief

Part Number	**88010801**
Type	CEE 7/7
Color	Gray
Rating	16A
Approvals	

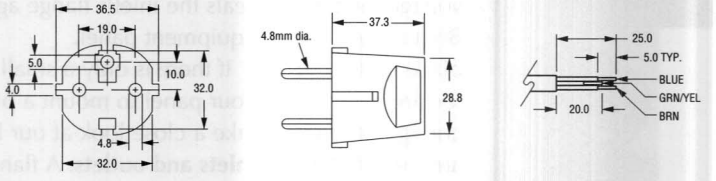


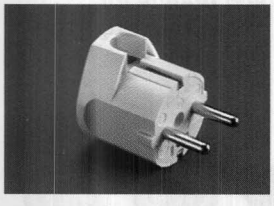
88010801 Assembly Instructions
Strip cable as shown • Open plug • Slide outer shell onto cordage • Wrap ground around terminal & tighten screw • Slide prepared cable through clamp • Connect conductors • Tighten clamp • Reassemble plug



Plug with strain relief

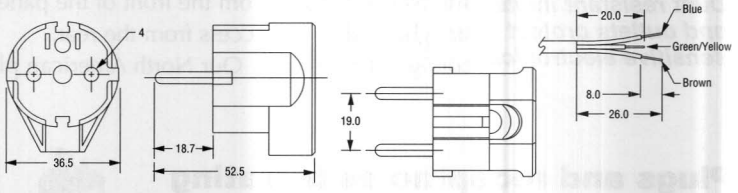
Part Number	**88010701**
Type	CEE 7/7
Color	Gray
Rating	16A/250VAC
Approvals	

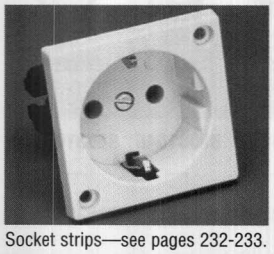




Plug with strain relief angled

Part Number	**88010965**
Type	CEE 7/7
Color	White
Rating	16A/250VAC
Approvals	

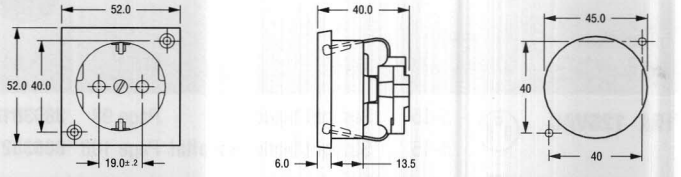


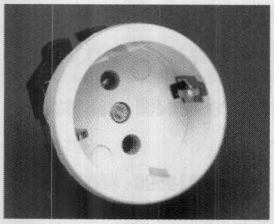


Socket strips—see pages 232-233.
Plug available in black (88010611).

Screw-mount socket

Part Number	**88010610**
Type	CEE 7
Color	Ivory
Rating	16A
Approvals	

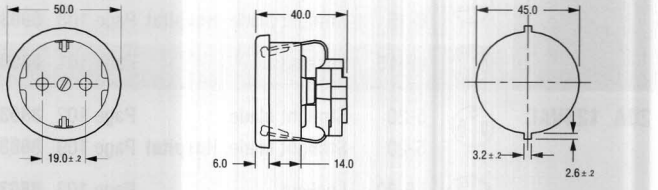




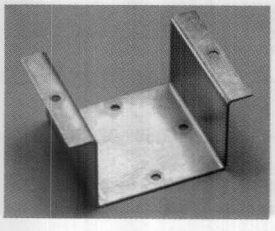
Socket strips—see pages 232-233.

Push-mount Socket

Part Number	**88010500**
Type	CEE 7
Color	Ivory
Rating	16A
Approvals	

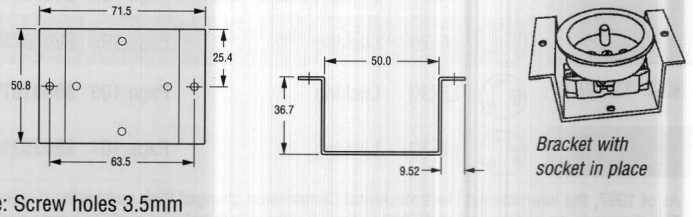


This model features a separate mounting bracket to meet Swedish requirements



Mounting bracket for 88010500

Part Number	**88090010**
Type	—
Color	—
Rating	—
Approvals	—



Bracket with socket in place

Note: Screw holes 3.5mm

Dimensions in mm

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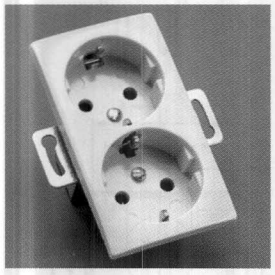
Continental European Plugs & Sockets

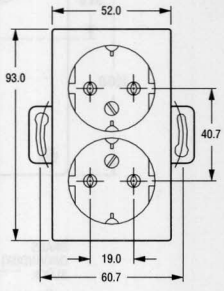
For use in Germany, Austria, Finland, the Netherlands, Norway, Sweden, and other countries utilizing the CEE 7 standard.

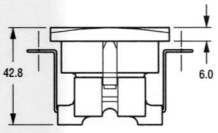
Continental European Plugs & Sockets

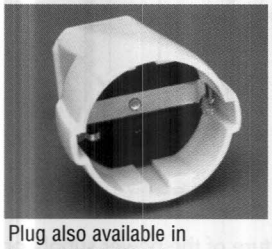


Duplex socket

Part Number	**88010200**
Type	CEE 7
Color	Ivory
Rating	16A
Approvals	



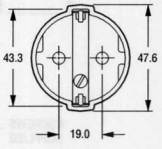


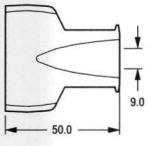


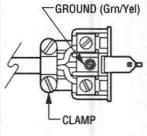
Plug also available in black (#88010390)

Socket with strain relief

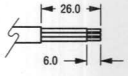
Part Number	**88010400**
Type	CEE 7/7
Color	Bright White
Rating	16A/250VAC
Approvals	

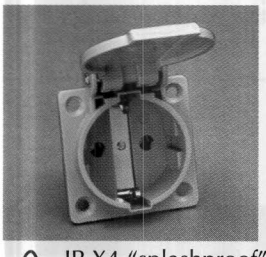






88010400 Assembly Instructions
Strip all three wires as shown • Remove shell • Slide shell onto cordage • Connect conductors • Fasten cord at clamp • Slide body into shell and tighten screw

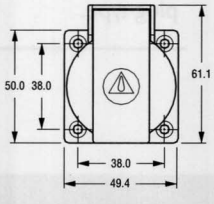


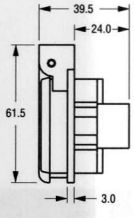


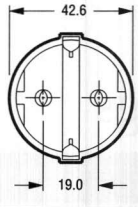
IP X4 "splashproof"
See mounting box page 111

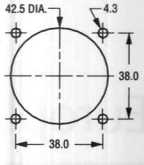
Cont. European (Schuko) Socket

Part Number	**88010300**
Type	CEE 7
Color	Gray
Rating	16A
Approvals	

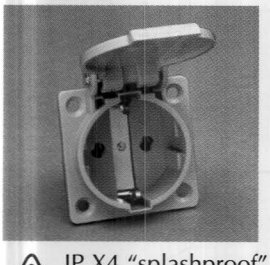








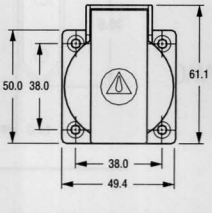
Mounting box 88090040 page 111

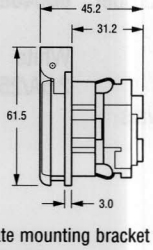


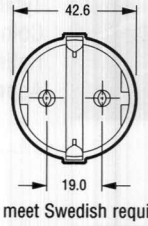
IP X4 "splashproof"
See mounting box page 111

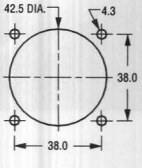
Cont. European — with attached mounting bracket

Part Number	**88010310**
Type	CEE 7/7
Color	Gray
Rating	16A
Approvals	



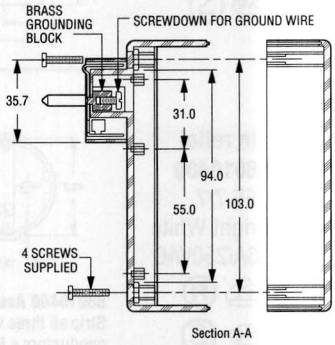


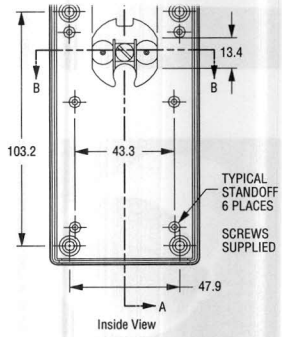




This model features a separate mounting bracket to meet Swedish requirements
Mounting box 88090040 page 111

Dimensions in mm

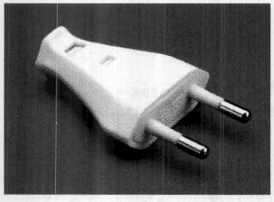




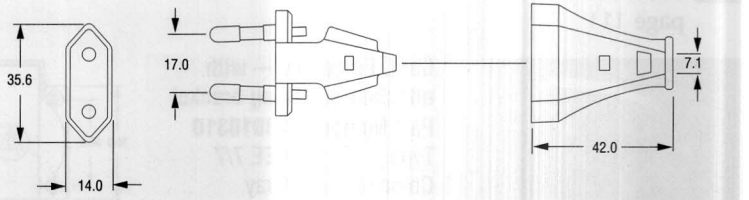
Wall mount plug boxes for use in design and manufacture of the power supply or control circuit (voltage spike protector, circuit protection, etc.) of your product. Plug box can be used to isolate the AC portion of your product which may simplify approval process on some products. Rating shown is the maximum rating for the plug type.

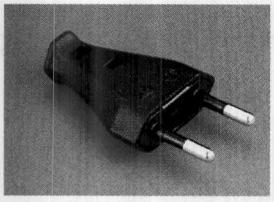
Europlugs

Europlugs

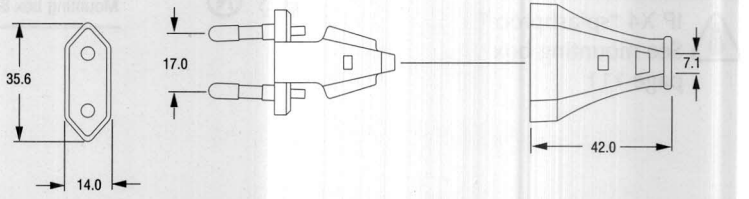


Plug	
Part Number	**88040040**
Type	
Color	White
Rating	2.5A/250VAC
Approvals	





Plug	
Part Number	**88040030**
Type	
Color	Black
Rating	2.5A/250VAC
Approvals	



Dimensions in mm

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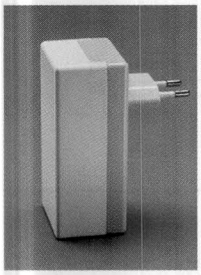
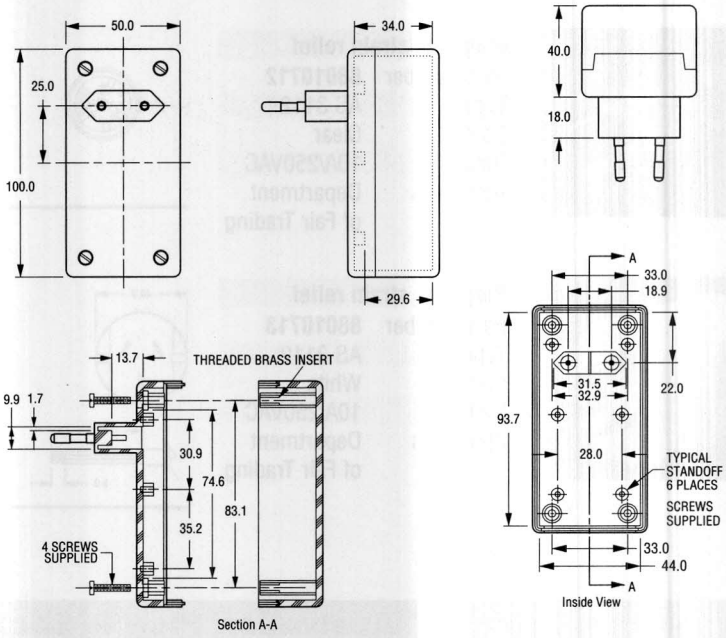
Fax toll-free: (800) 645-5360

Europlugs cont.



Europlug	
Part Number	**88010100**
Type	CEE 7
Color	Gray
Rating	2.5A/250VAC
Approvals	—



Wall mount plug boxes for use in design and manufacture of the power supply or control circuit (voltage spike protector, circuit protection, etc.) of your product. Plug box can be used to isolate the AC portion of your product which may simplify approval process on some products. Rating shown is the maximum rating for the plug type.

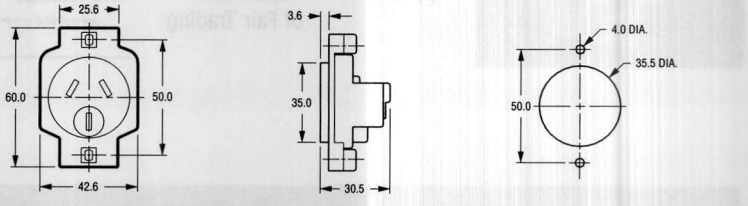
Australian Plugs & Sockets

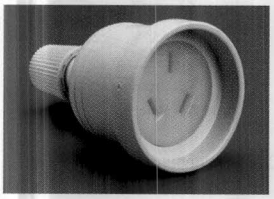
Plug and in-line sockets are also acceptable for use in New Zealand according to the New Zealand Ministry of Energy. In-house made to order assembly services are available. For assistance, see pages 75-86 or contact our Customer Service Department toll free at the numbers below.

Australian Plugs & Sockets (10A)

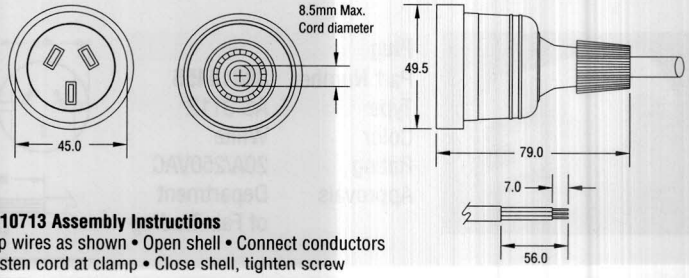
Socket strips—see pages 234.

Socket	
Part Number	**88010512**
Type	AS 3112
Color	White
Rating	10A/250VAC
Approvals	Department of Fair Trading





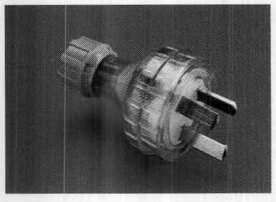
In-line socket	
Part Number	**88010411**
Type	AS 3112
Color	White
Rating	10A/250VAC
Approvals	Department of Fair Trading



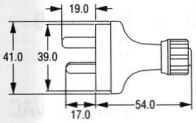
88010713 Assembly Instructions
Strip wires as shown • Open shell • Connect conductors • Fasten cord at clamp • Close shell, tighten screw

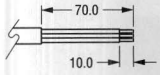
Dimensions in mm

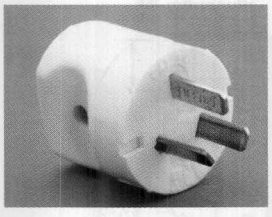
Australian Plugs & Sockets (10A cont.)



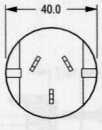
Plug with strain relief	
Part Number	**88010712**
Type	AS 3112
Color	Clear
Rating	10A/250VAC
Approvals	Department of Fair Trading

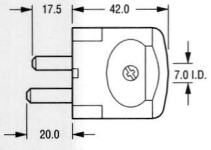


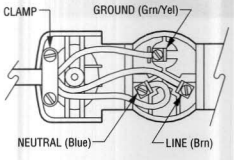


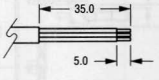


Plug with strain relief	
Part Number	**88010713**
Type	AS 3112
Color	White
Rating	10A/250VAC
Approvals	Department of Fair Trading



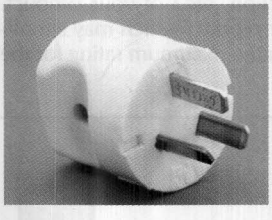




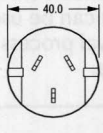


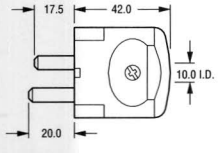
88010713 Assembly Instructions
Strip wires as shown • Open shell • Connect conductors • Fasten cord at clamp • Close shell, tighten screw

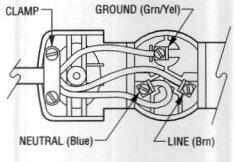
Australian Plug & Socket (15A)

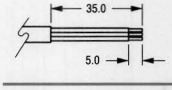


Plug	
Part Number	**88010450**
Type	AS 3112
Color	White
Rating	15A/250VAC
Approvals	Department of Fair Trading

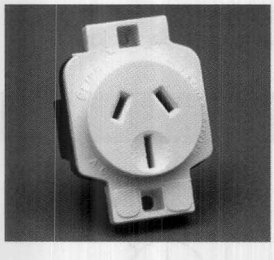




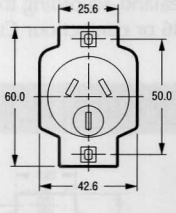


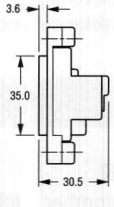


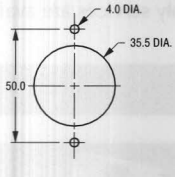
88010713 Assembly Instructions
Strip wires as shown • Open shell • Connect conductors • Fasten cord at clamp • Close shell, tighten screw



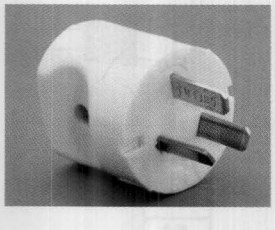
Socket	
Part Number	**88010441**
Type	AS 3112
Color	White
Rating	15A/250VAC
Approvals	Department of Fair Trading



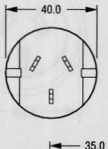


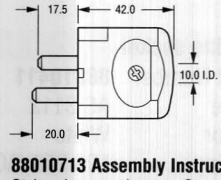


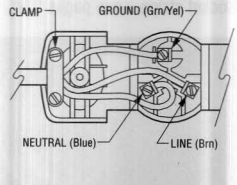
Australian Socket (20A)

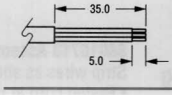


Plug	
Part Number	**88010455**
Type	AS 3112
Color	White
Rating	20A/250VAC
Approvals	Department of Fair Trading









88010713 Assembly Instructions
Strip wires as shown • Open shell • Connect conductors • Fasten cord at clamp • Close shell, tighten screw

Dimensions in mm

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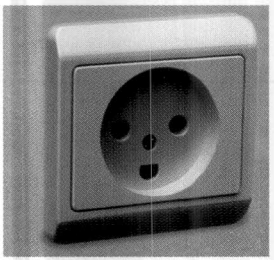
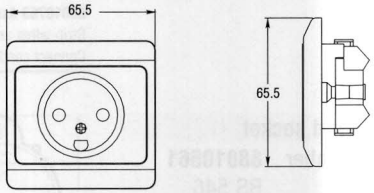
Fax toll-free: (800) 645-5360



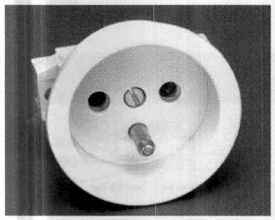
Socket	
Part Number	**88010541**
Type	Afsnit 107-2-D1
Color	Gray
Rating	10A/250VAC
Approvals	Ⓓ



French/Belgian Sockets

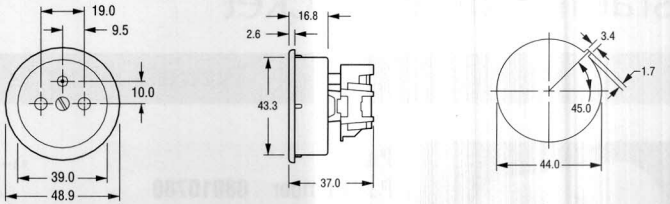
France and Belgium use a variation of the CEE 7 socket which contains a male grounding pin. The CEE 7/7 plug used throughout Continental Europe has a receptacle for this pin and can therefore be used in France and Belgium. See 88010801, page 90, or the molded cordsets on pages 24-26. Note: France and Belgium now require safety shuttering on all their sockets.

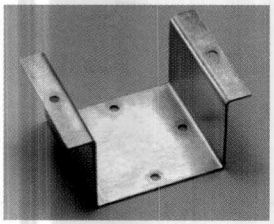
French/Belgian Socket (10A)



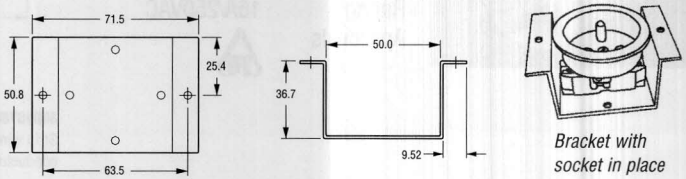
Panel-mounting socket	
Part Number	**88010550**
Type	Var. of CEE 7
Color	Gray
Rating	16A/250VAC
Approvals	—

See page 234 for French socket strip.

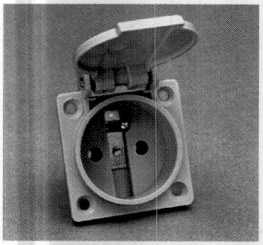




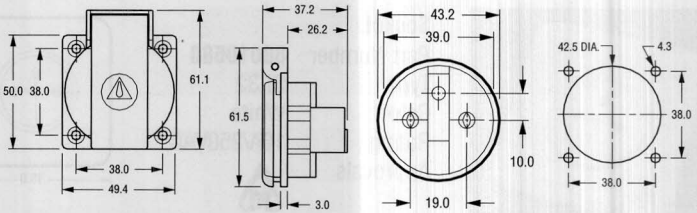
Mounting bracket for 88010550	
Part Number	**88090010**
Material	18 Gauge, sheet steel yellow-plated zinc



Bracket with socket in place



Panel-mounting socket	
Part Number	**88010321**
Type	Var. of CEE 7
Color	Gray
Rating	16A/250VAC
Approvals	—



Mounting box 88090040 page 111

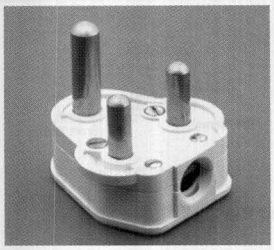
IP X4 "splashproof"

Dimensions in mm

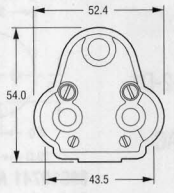
Indian/South African (BS 546) Plug & Socket

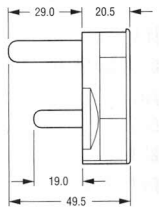
Old British standard (see page 16 for more information)

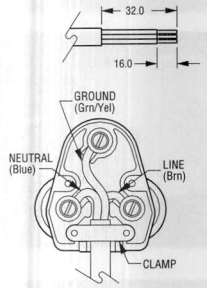
Indian/South African Plug & Socket (15A)



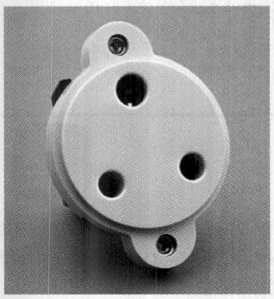
Plug	
Part Number	**88010763**
Type	BS 546
Color	White
Rating	15A/250VAC
Approvals	None required





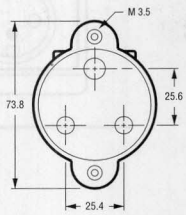


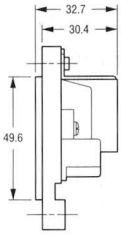
88010763 Assembly Instructions
Strip wires as shown • Remove back • Slide cordage through clamp • Connect conductors • Tighten down clamp • Replace back.

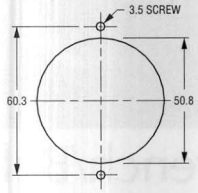


Shuttered socket	
Part Number	**88010561**
Type	BS 546
Color	White
Rating	15A/250VAC
Approvals	None required

panel-mounting socket



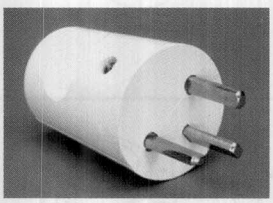




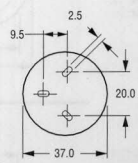
Note: Mounting screws 3.5mm

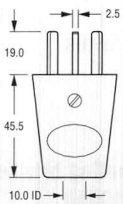
Israeli Plug & Socket

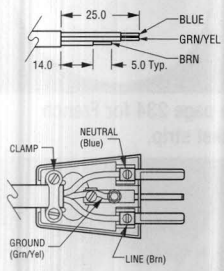
Israeli Plug & Socket (16A)



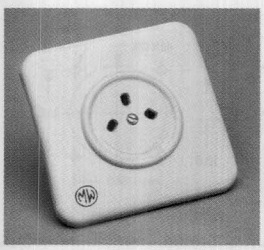
Plug	
Part Number	**88010780**
Type	SI 32
Color	White
Rating	16A/250VAC
Approvals	





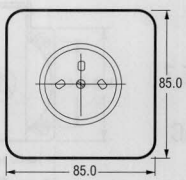


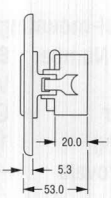
88010780 Assembly Instructions
Strip wires as shown • Open plug • Loosen cable clamp • Connect conductors • Tighten cable clamp • Close plug and tighten screw

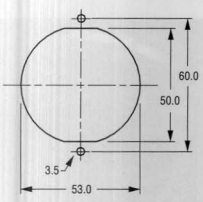


Socket	
Part Number	**88010580**
Type	SI 32
Color	White
Rating	16A/250VAC
Approvals	

panel-mounting socket







Dimensions in mm

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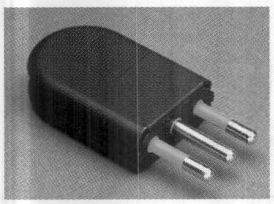
Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360

Italian Plugs & Sockets

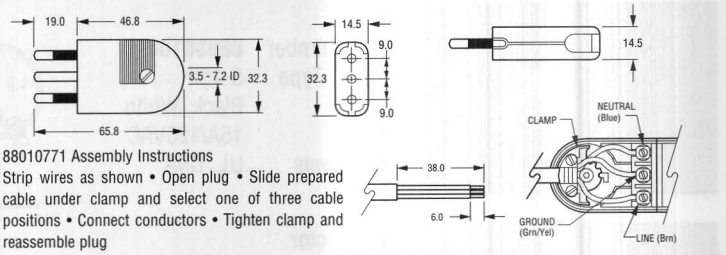
Both 10A and 16A Italian plugs and sockets are stocked. In-house made to order assembly services available (see pages 75-86), or contact our Customer Service Department toll free at the numbers below.

Italian Plug & Socket (10A)

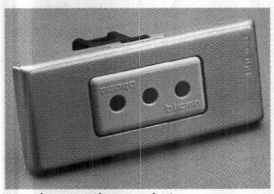


Note: This plug is **not** polarized.

Plug	
Part Number	**88010771**
Type	CEI 23-16/VII
Color	Gray
Rating	10A/250VAC
Approvals	

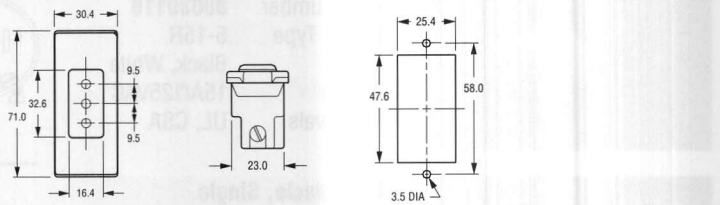


88010771 Assembly Instructions
Strip wires as shown • Open plug • Slide prepared cable under clamp and select one of three cable positions • Connect conductors • Tighten clamp and reassemble plug

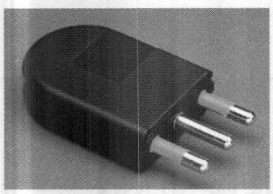


panel-mounting socket

Shuttered socket	
Part Number	**88010572**
Type	CEI 23-16/VII
Color	Silver/metallic
Rating	10A/250VAC
Approvals	

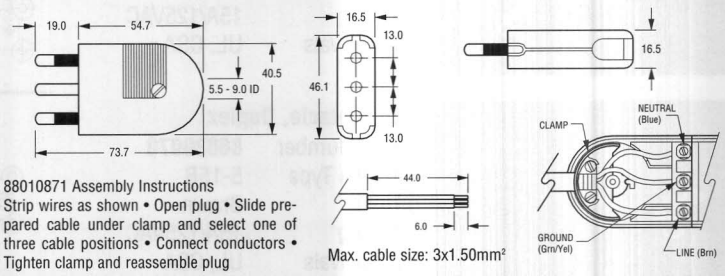


Italian Plug & Socket (16A)



Note: This plug is **not** polarized.

Plug	
Part Number	**88010871**
Type	CEI 23-16/VII
Color	Gray
Rating	16A/250VAC
Approvals	

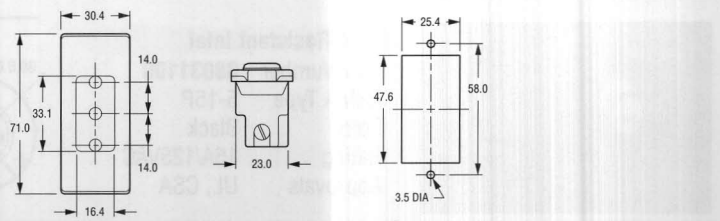


88010871 Assembly Instructions
Strip wires as shown • Open plug • Slide prepared cable under clamp and select one of three cable positions • Connect conductors • Tighten clamp and reassemble plug

Max. cable size: 3x1.50mm²

panel-mounting socket

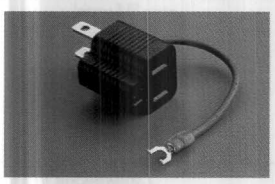
Shuttered socket	
Part Number	**88010672**
Type	CEI 23-16/VII
Color	Silver/metallic
Rating	16A/250VAC
Approvals	



Grounding Adapter (flat blade, 3-wire to 2-wire)

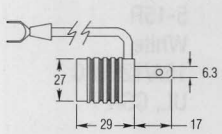
When exporting your product to Japan or other parts of the world (such as Central America) where 2-wire, unpolarized mains power is typical, it is advisable to include a grounding adapter to ensure that your product will be properly grounded. The grounding adapter shown below is a 3-wire to 2-wire adapter with unpolarized blades. It carries Japanese approvals; see pages 47-48 for Japanese cordsets. See fold-out poster for a guide on which countries use 2-wire flat blade connections.

Grounding Adapter (Japanese approvals)



Note: Japanese approvals

Grounding Adapter	
Part Number	**88100011**
Type	—
Color	Black
Rating	15A/125VAC
Approvals	



Dimensions in mm

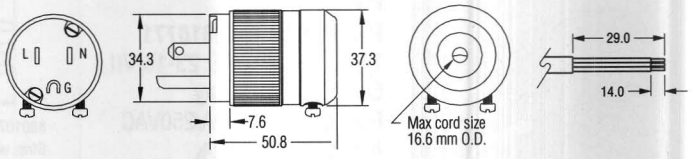
15A/125VAC Straight-Blade Models

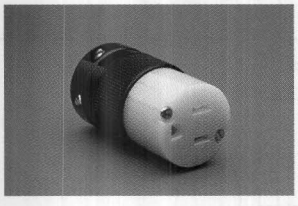
The NEMA 5-15 plug and receptacle configuration below is by far the most commonly used 3-pole plug used in the United States and Canada. Hospital-grade models are shown on page 108-109.

15A/125V Straight Blade Models (NEMA 5-15)

Plug

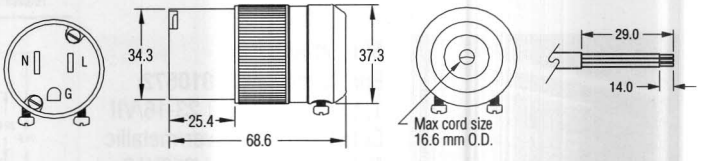
Part Number	**88030100**
NEMA Type	5-15P
Color	Black, White
Rating	15A/125VAC
Approvals	UL, CSA

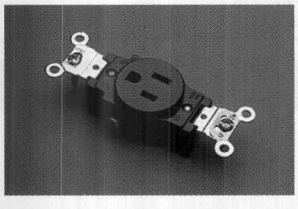




Connector

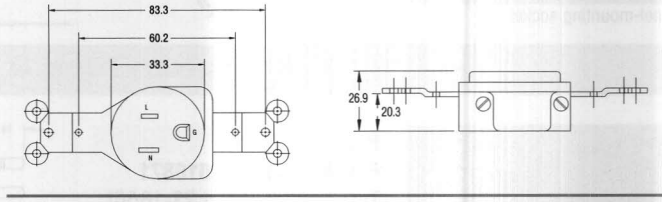
Part Number	**88030110**
NEMA Type	5-15R
Color	Black, White
Rating	15A/125VAC
Approvals	UL, CSA

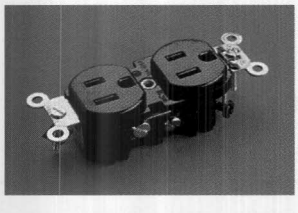




Receptacle, Single

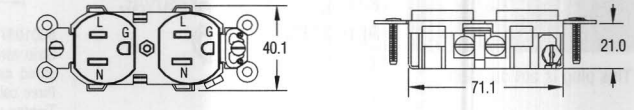
Part Number	**88031010**
NEMA Type	5-15R
Color	Brown
Rating	15A/125VAC
Approvals	UL, CSA

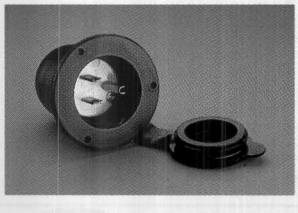




Receptacle, Duplex

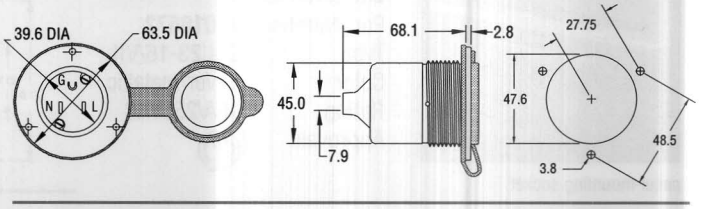
Part Number	**88030070**
NEMA Type	5-15R
Color	Brown
Rating	15A/125VAC
Approvals	UL, CSA

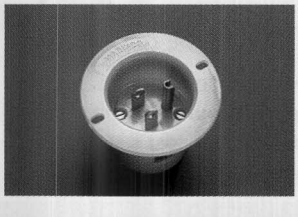




Dust-Resistant Inlet

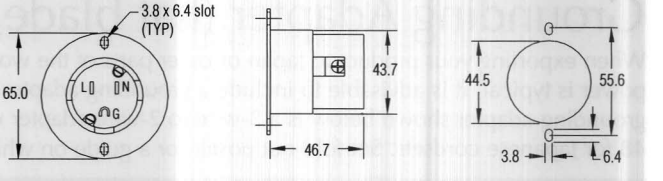
Part Number	**88031100**
NEMA Type	5-15P
Color	Black
Rating	15A/125VAC
Approvals	UL, CSA

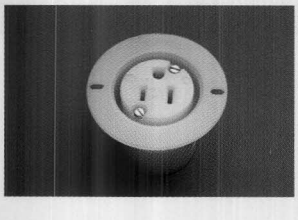




Flanged Inlet

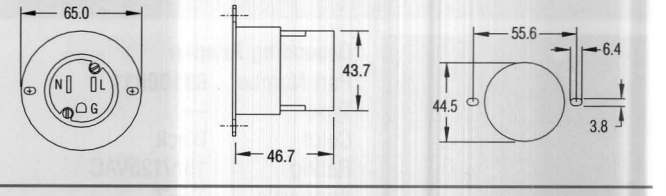
Part Number	**88031040**
NEMA Type	5-15P
Color	White
Rating	15A/125VAC
Approvals	UL, CSA





Flanged Outlet

Part Number	**88031030**
NEMA Type	5-15R
Color	White
Rating	15A/125VAC
Approvals	UL, CSA



Dimensions in mm

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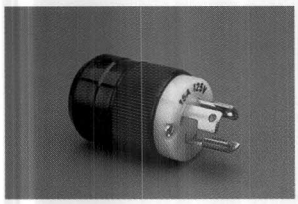
15A/125VAC Locking Models

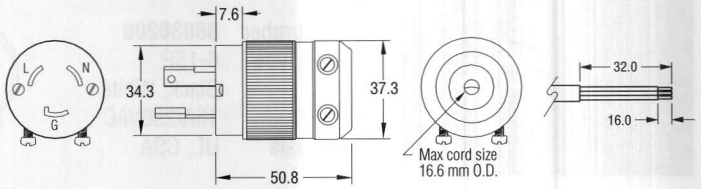
- Locking models provide a more secure power connection.
- Material Specifications: see page 88.
- Custom power cord assemblies available.
- Mounting box: see back cover.

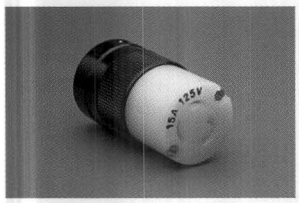
15A/125V Locking Models (NEMA L5-15)



Plug

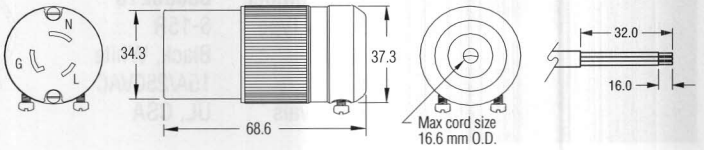
Part Number	**88030240**
NEMA Type	L5-15P
Color	Black, White
Rating	15A/125VAC
Approvals	UL, CSA

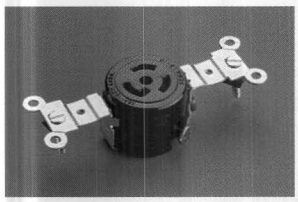




Connector

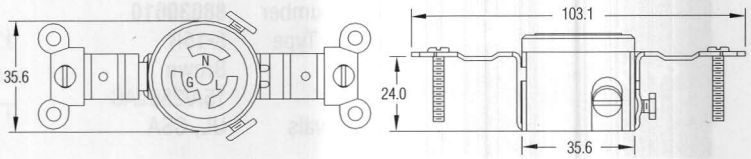
Part Number	**88030250**
NEMA Type	L5-15R
Color	Black, White
Rating	15A/125VAC
Approvals	UL, CSA

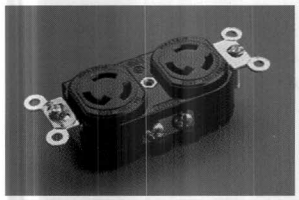




Receptacle, Single

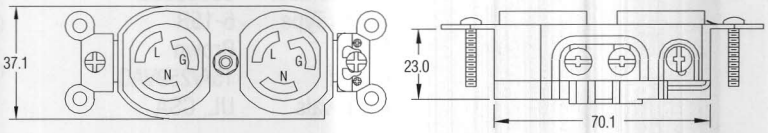
Part Number	**88031210**
NEMA Type	L5-15R
Color	Black
Rating	15A/125VAC
Approvals	UL, CSA

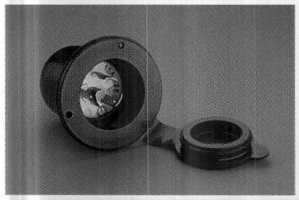




Receptacle, Duplex

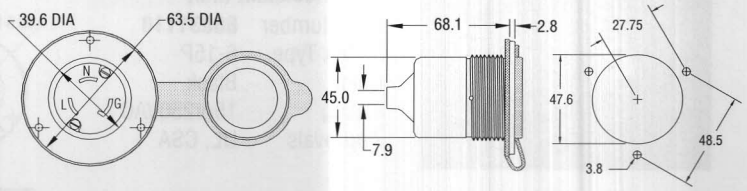
Part Number	**88031220**
NEMA Type	L5-15R
Color	Black
Rating	15A/125VAC
Approvals	UL, CSA

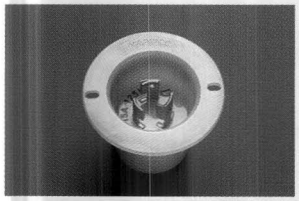




Dust-Resistant Inlet

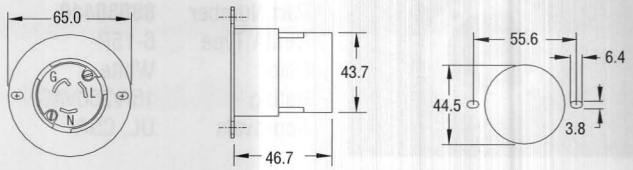
Part Number	**88031140**
NEMA Type	L5-15P
Color	Black
Rating	15A/125VAC
Approvals	UL, CSA

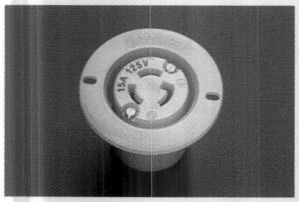




Flanged Inlet

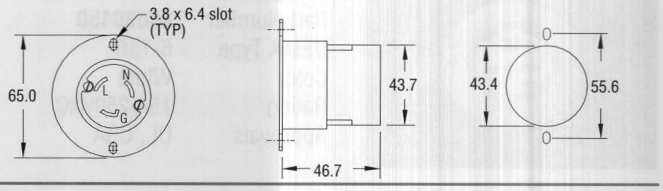
Part Number	**88030480**
NEMA Type	L5-15P
Color	White
Rating	15A/125VAC
Approvals	UL, CSA



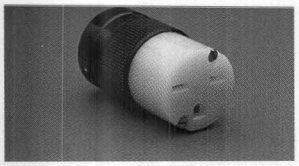


Flanged Outlet

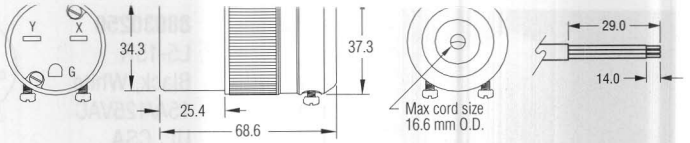
Part Number	**88030490**
NEMA Type	L5-15R
Color	White
Rating	15A/125VAC
Approvals	UL, CSA

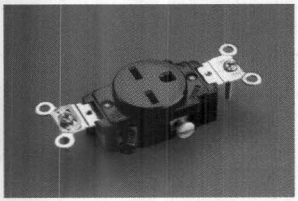


Dimensions in mm



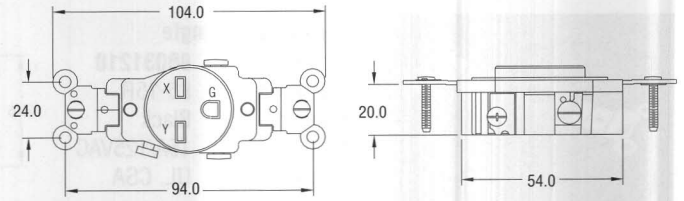
Part Number	88030210
NEMA Type	6-15R
Color	Black, White
Rating	15A/250VAC
Approvals	UL, CSA

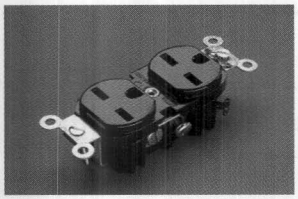




Receptacle, Single

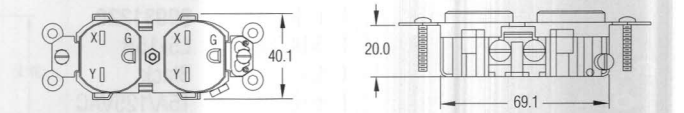
Part Number	**88030610**
NEMA Type	6-15R
Color	Brown
Rating	15A/250VAC
Approvals	UL, CSA

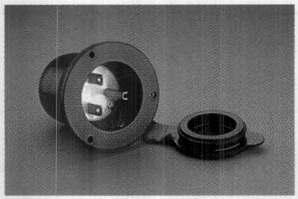




Receptacle, Duplex

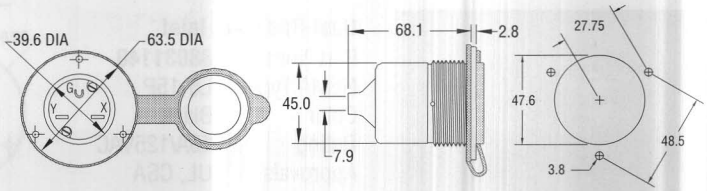
Part Number	**88030590**
NEMA Type	6-15R
Color	Brown
Rating	15A/250VAC
Approvals	UL, CSA

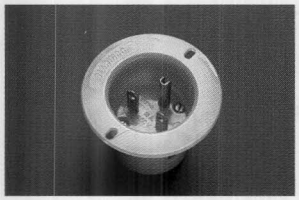




Dust-Resistant Inlet

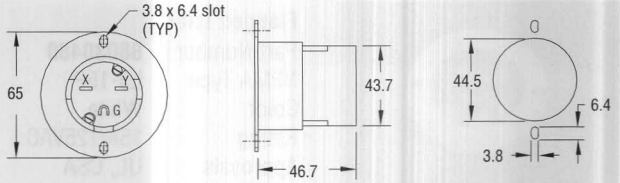
Part Number	**88031110**
NEMA Type	6-15P
Color	Black
Rating	15A/250VAC
Approvals	UL, CSA

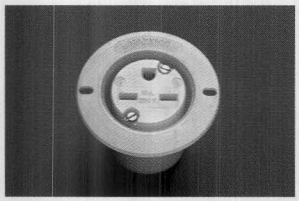




Flanged Inlet

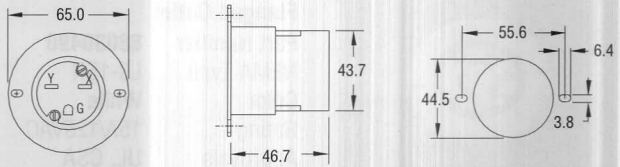
Part Number	**88030440**
NEMA Type	6-15P
Color	White
Rating	15A/250VAC
Approvals	UL, CSA





Flanged Outlet

Part Number	**88030450**
NEMA Type	6-15R
Color	White
Rating	15A/250VAC
Approvals	UL, CSA



Dimensions in mm

Note: Drawings with plug pins or receptacle slots designated with an "X" or "Y" are 250V max. devices. The X and Y designations are used to indicate that both pins or slots are "hot" in respect to ground (125V potential; when measured from designated pin or slot to ground). Since the X and Y terminals are both supplying power, wire placement is not critical, and thus not specified.

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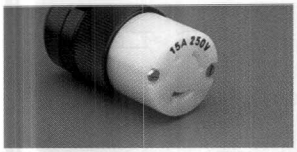
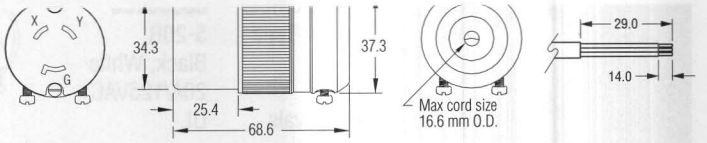
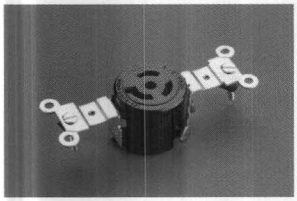


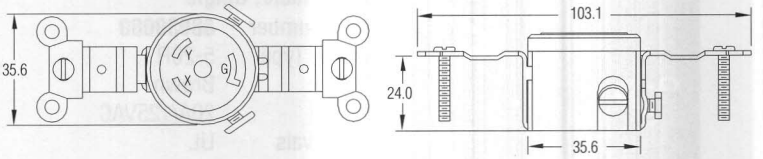
NEMA Type	L6-15R
Color	Black, White
Rating	15A/250VAC
Approvals	UL, CSA

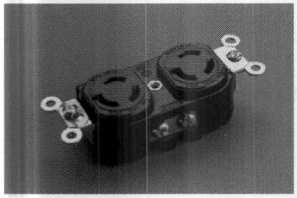




Receptacle, Single

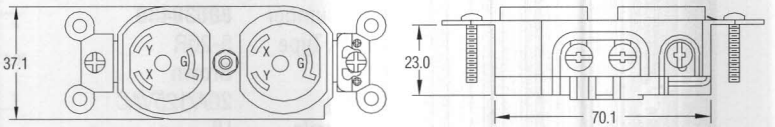
Part Number	**88030630**
NEMA Type	L6-15R
Color	Black
Rating	15A/250VAC
Approvals	UL, CSA

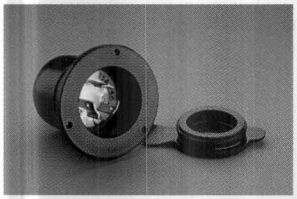




Receptacle, Duplex

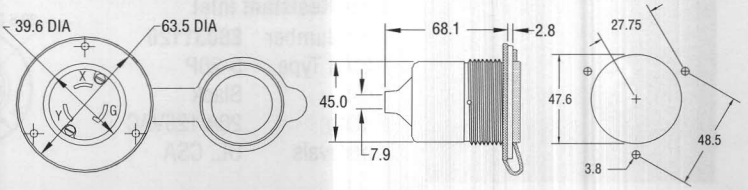
Part Number	**88030640**
NEMA Type	L6-15R
Color	Black
Rating	15A/250VAC
Approvals	UL, CSA

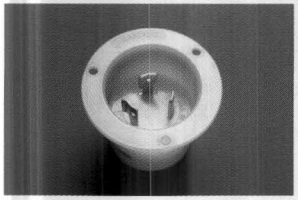




Dust-Resistant Inlet

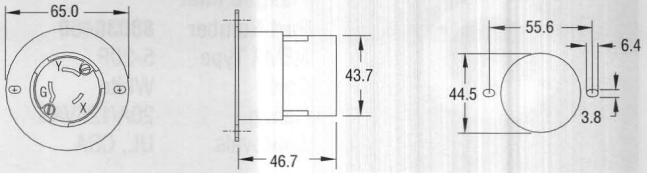
Part Number	**88031150**
NEMA Type	L6-15P
Color	Black
Rating	15A/250VAC
Approvals	UL, CSA

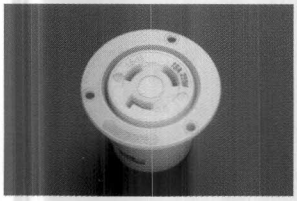




Flanged Inlet

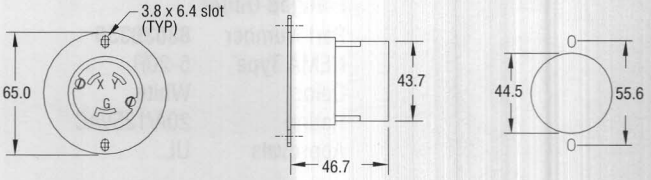
Part Number	**88030650**
NEMA Type	L6-15P
Color	White
Rating	15A/250VAC
Approvals	UL, CSA





Flanged Outlet

Part Number	**88030660**
NEMA Type	L6-15R
Color	White
Rating	15A/250VAC
Approvals	UL, CSA



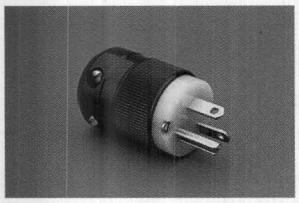
Dimensions in mm

Note: Drawings with plug pins or receptacle slots designated with an "X" or "Y" are 250V max. devices. The X and Y designations are used to indicate that both pins or slots are "hot" in respect to ground (125V potential; when measured from designated pin or slot to ground). Since the X and Y terminals are both supplying power, wire placement is not critical, and thus not specified.

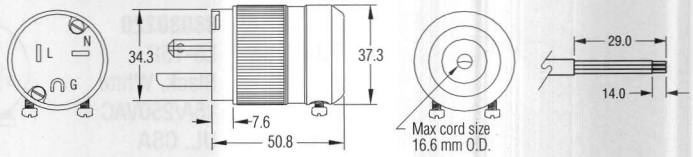
20A/125VAC Straight-Blade Models

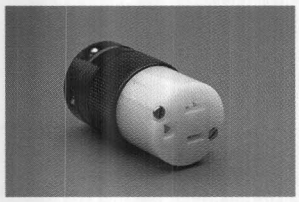
- Hospital-grade models are shown on page 108-109.
- Material Specifications: see page 88.
- Custom power cord assemblies available.
- Mounting box: see back cover.

20A/125V Straight Blade Models (NEMA 5-20)

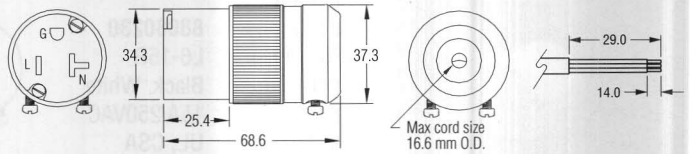


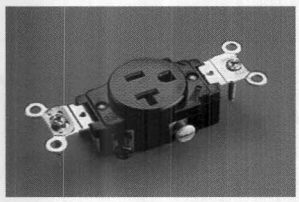
Plug	
Part Number	**88030120**
NEMA Type	5-20P
Color	Black, White
Rating	20A/125VAC
Approvals	UL, CSA



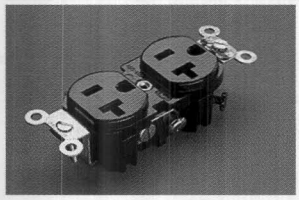


Connector	
Part Number	**88030130**
NEMA Type	5-20R
Color	Black, White
Rating	20A/125VAC
Approvals	UL

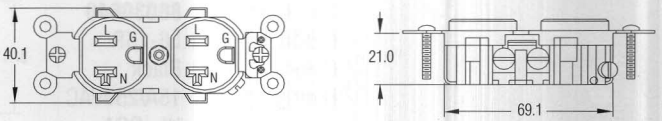


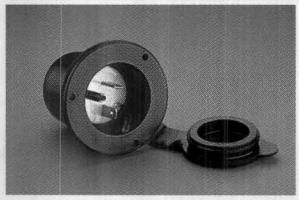


Receptacle, Single	
Part Number	**88030080**
NEMA Type	5-20R
Color	Brown
Rating	20A/125VAC
Approvals	UL

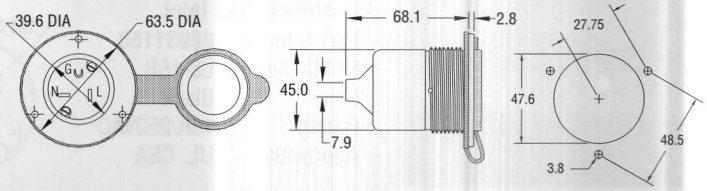


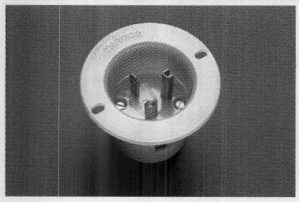
Receptacle, Duplex	
Part Number	**88030430**
NEMA Type	5-20R
Color	Brown
Rating	20A/125VAC
Approvals	UL



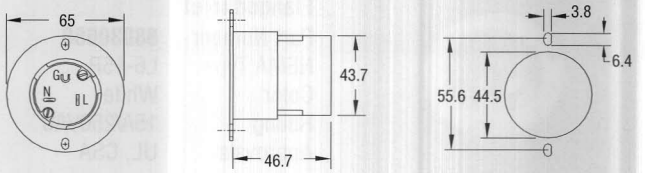


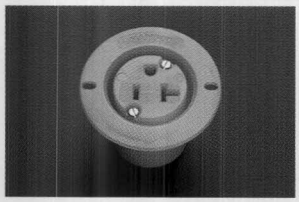
Dust-Resistant Inlet	
Part Number	**88031120**
NEMA Type	5-20P
Color	Black
Rating	20A/125VAC
Approvals	UL, CSA



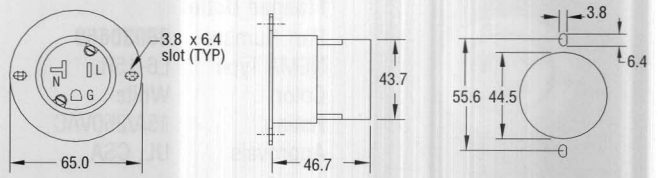


Flanged Inlet	
Part Number	**88030460**
NEMA Type	5-20P
Color	White
Rating	20A/125VAC
Approvals	UL, CSA





Flanged Outlet	
Part Number	**88030330**
NEMA Type	5-20R
Color	White
Rating	20A/125VAC
Approvals	UL



Dimensions in mm

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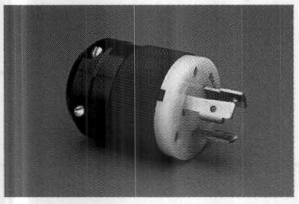
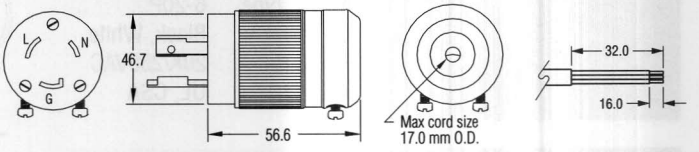
20A/125VAC Locking Models

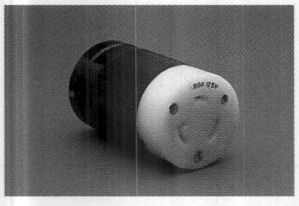
- Locking models provide a more secure power connection.
- Material Specifications: see page 88.
- Custom power cord assemblies available.
- Mounting box: see back cover.

20A/125V Locking Models (NEMA L5-20)

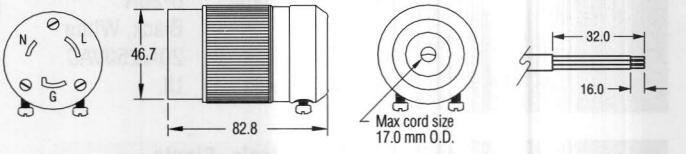


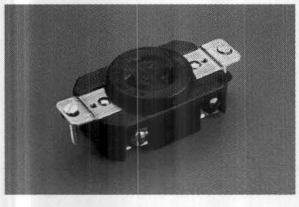
Plug	
Part Number	**88030140**
NEMA Type	L5-20P
Color	Black, White
Rating	20A/125VAC
Approvals	UL, CSA



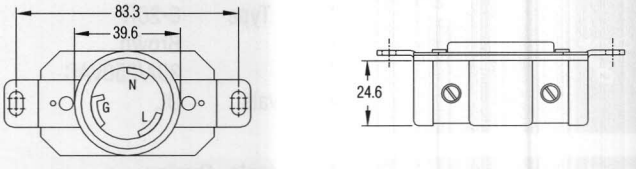


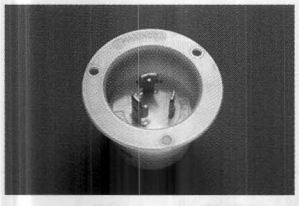
Connector	
Part Number	**88030150**
NEMA Type	L5-20R
Color	Black, White
Rating	20A/125VAC
Approvals	UL, CSA



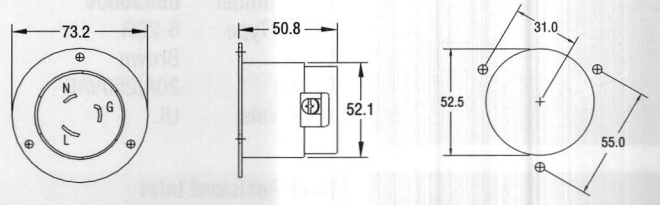


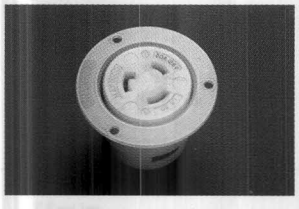
Receptacle, Single	
Part Number	**88030300**
NEMA Type	L5-20R
Color	Black
Rating	20A/125VAC
Approvals	UL, CSA



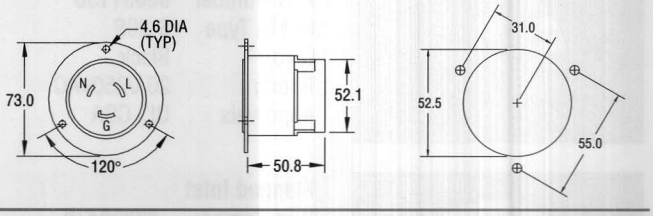


Flanged Inlet	
Part Number	**88030500**
NEMA Type	L5-20P
Color	White
Rating	20A/125VAC
Approvals	UL, CSA

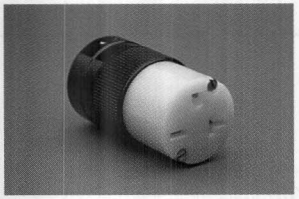




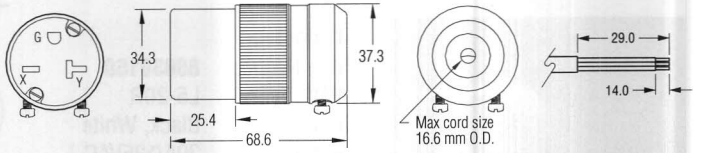
Flanged Outlet	
Part Number	**88030510**
NEMA Type	L5-20R
Color	White
Rating	20A/125VAC
Approvals	UL, CSA

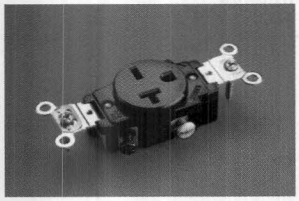


Dimensions in mm

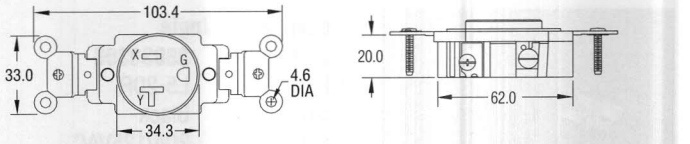


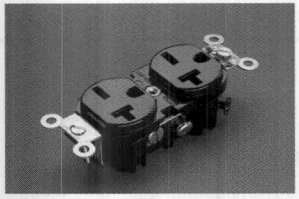
Connector	
Part Number	**88030190**
NEMA Type	6-20R
Color	Black, White
Rating	20A/250VAC
Approvals	UL



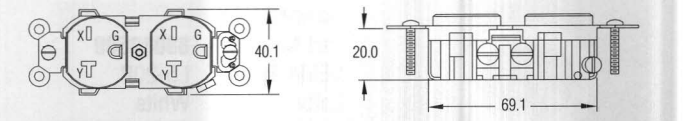


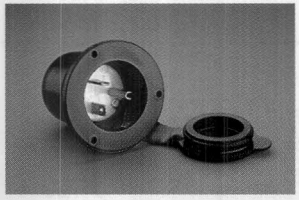
Receptacle, Single	
Part Number	**88030620**
NEMA Type	6-20R
Color	Brown
Rating	20A/250VAC
Approvals	UL



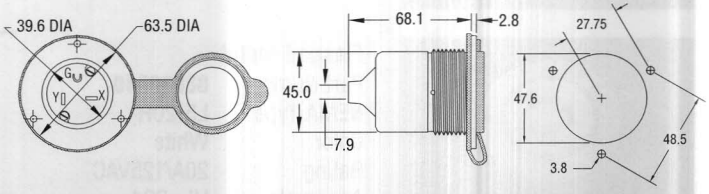


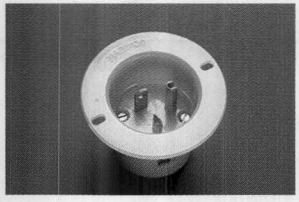
Receptacle, Duplex	
Part Number	**88030600**
NEMA Type	6-20R
Color	Brown
Rating	20A/250VAC
Approvals	UL



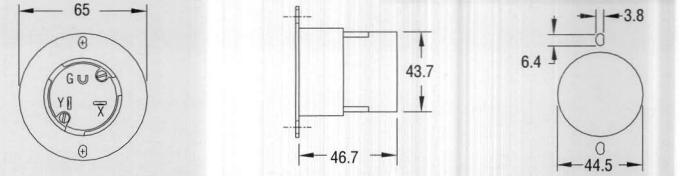


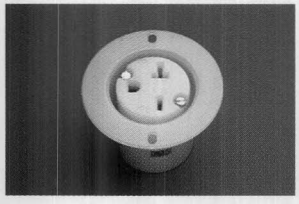
Dust-Resistant Inlet	
Part Number	**88031130**
NEMA Type	6-20P
Color	Black
Rating	20A/250VAC
Approvals	UL, CSA



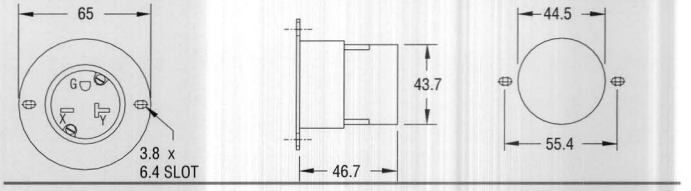


Flanged Inlet	
Part Number	**88030470**
NEMA Type	6-20P
Color	White
Rating	20A/250VAC
Approvals	UL, CSA





Flanged Outlet	
Part Number	**88030030**
NEMA Type	6-20R
Color	White
Rating	20A/250VAC
Approvals	UL



Dimensions in mm

Note: Drawings with plug pins or receptacle slots designated with an "X" or "Y" are 250V max. devices. The X and Y designations are used to indicate that both pins or slots are "hot" in respect to ground (125V potential; when measured from designated pin or slot to ground). Since the X and Y terminals are both supplying power, wire placement is not critical, and thus not specified.

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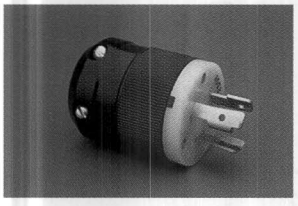
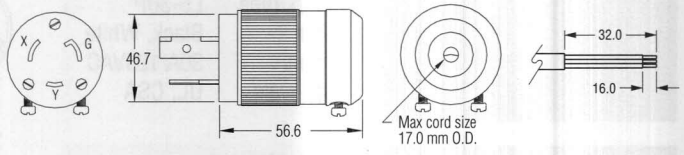
20A/250VAC Locking Models

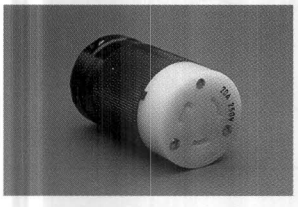
- Locking models provide a more secure power connection.
- Material Specifications: see page 88.
- Custom power cord assemblies available.
- Mounting box: see back cover.

20A/250V Locking Models (NEMA L6-20)

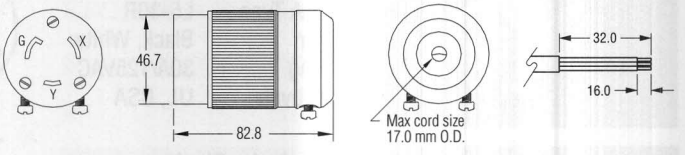


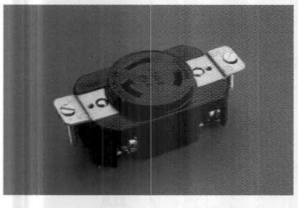
Plug	
Part Number	**88030160**
NEMA Type	L6-20P
Color	Black, White
Rating	20A/250VAC
Approvals	UL, CSA



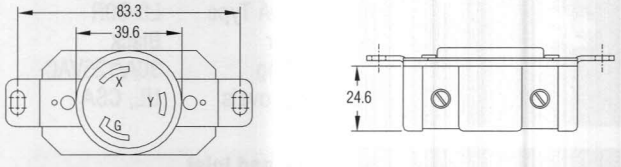


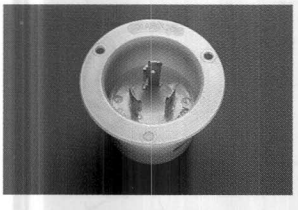
Connector	
Part Number	**88030170**
NEMA Type	L6-20R
Color	Black, White
Rating	20A/250VAC
Approvals	UL, CSA



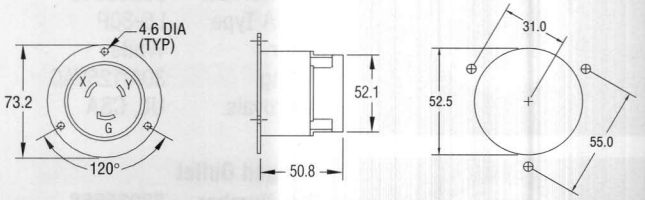


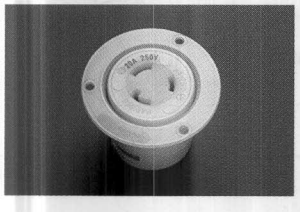
Receptacle, Single	
Part Number	**88031080**
NEMA Type	L6-20R
Color	Black
Rating	20A/250VAC
Approvals	UL, CSA



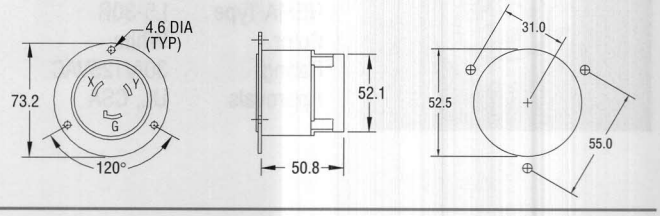


Flanged Inlet	
Part Number	**88030090**
NEMA Type	L6-20P
Color	White
Rating	20A/250VAC
Approvals	UL, CSA





Flanged Outlet	
Part Number	**88030530**
NEMA Type	L6-20R
Color	White
Rating	20A/250VAC
Approvals	UL, CSA



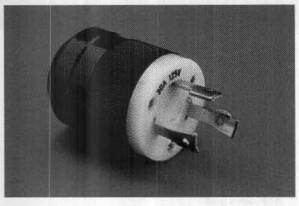
Dimensions in mm

Note: Drawings with plug pins or receptacle slots designated with an "X" or "Y" are 250V max. devices. The X and Y designations are used to indicate that both pins or slots are "hot" in respect to ground (125V potential; when measured from designated pin or slot to ground). Since the X and Y terminals are both supplying power, wire placement is not critical, and thus not specified.

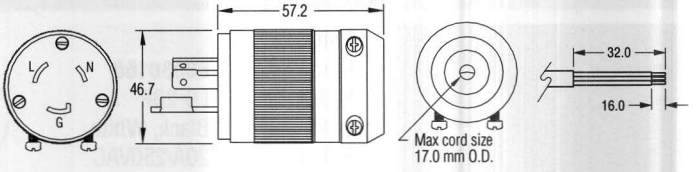
30A/125VAC Locking Models

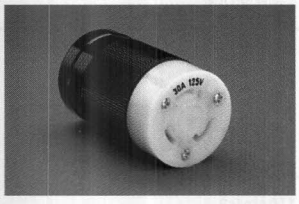
- Hospital-grade models are shown on page 108-109.
- Material Specifications: see page 88.
- Custom power cord assemblies available.
- Mounting box: see back cover.

30A/125V Locking Models (NEMA L5-30)

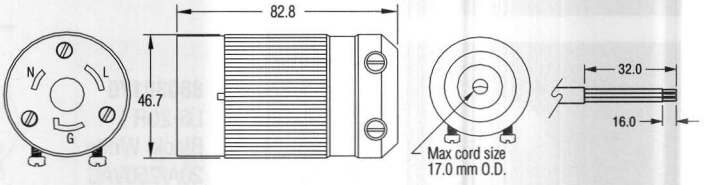


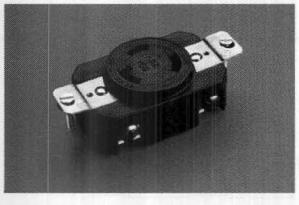
Plug	
Part Number	**88031070**
NEMA Type	L5-30P
Color	Black, White
Rating	30A/125VAC
Approvals	UL, CSA



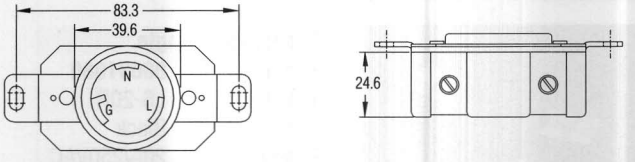


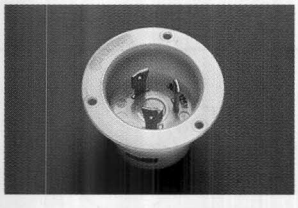
Connector	
Part Number	**88031160**
NEMA Type	L5-30R
Color	Black, White
Rating	30A/125VAC
Approvals	UL, CSA



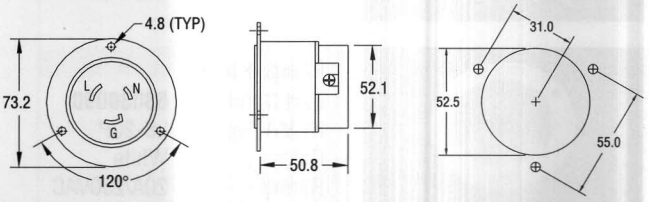


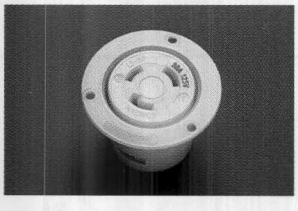
Receptacle, Single	
Part Number	**88031170**
NEMA Type	L5-30R
Color	Black
Rating	30A/125VAC
Approvals	UL, CSA



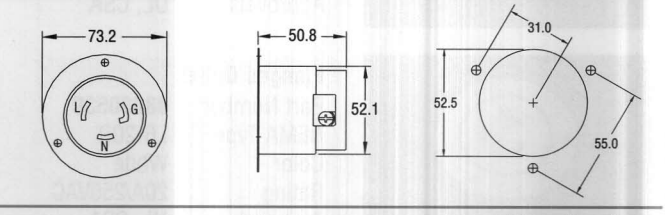


Flanged Inlet	
Part Number	**88030540**
NEMA Type	L5-30P
Color	White
Rating	30A/125VAC
Approvals	UL, CSA





Flanged Outlet	
Part Number	**88030550**
NEMA Type	L5-30R
Color	White
Rating	30A/125VAC
Approvals	UL, CSA



Dimensions in mm

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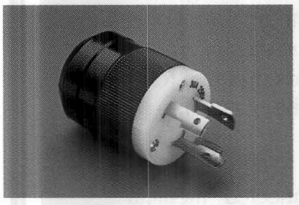
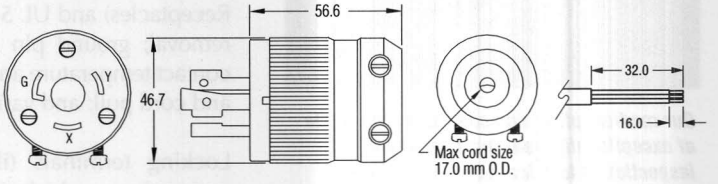
30A/250VAC Locking Models

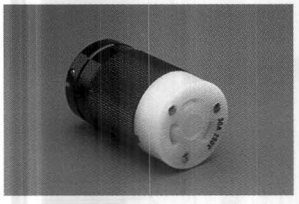
- Locking models provide a more secure power connection.
- Material Specifications: see page 88.
- Custom power cord assemblies available.
- Mounting box: see back cover.

30A250V Locking Models (NEMA L6-30)

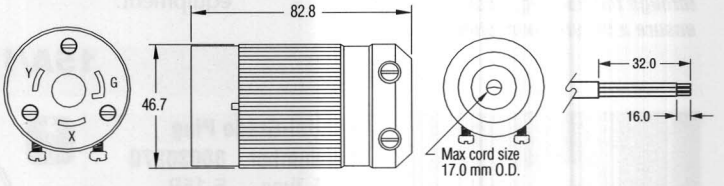


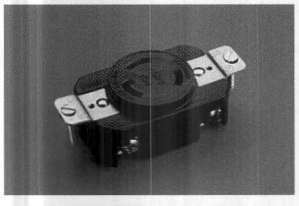
Plug	
Part Number	**88030310**
NEMA Type	L6-30P
Color	Black, White
Rating	30A/250VAC
Approvals	UL, CSA



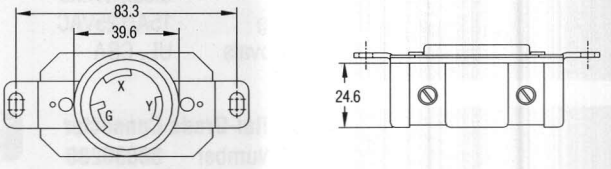


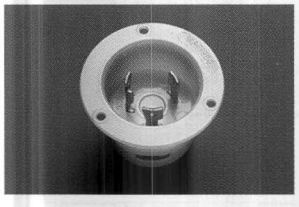
Connector	
Part Number	**88030320**
NEMA Type	L6-30R
Color	Black, White
Rating	30A/250VAC
Approvals	UL, CSA



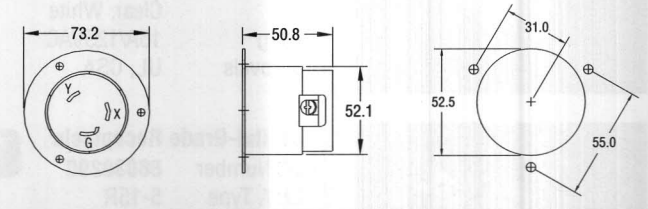


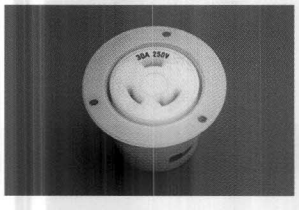
Receptacle, Single	
Part Number	**88031180**
NEMA Type	L6-30R
Color	Black
Rating	30A/250VAC
Approvals	UL, CSA



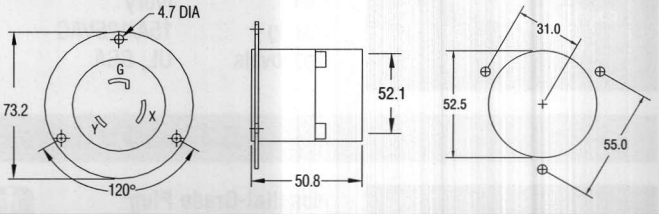


Flanged Inlet	
Part Number	**88030560**
NEMA Type	L6-30P
Color	White
Rating	30A/250VAC
Approvals	UL, CSA



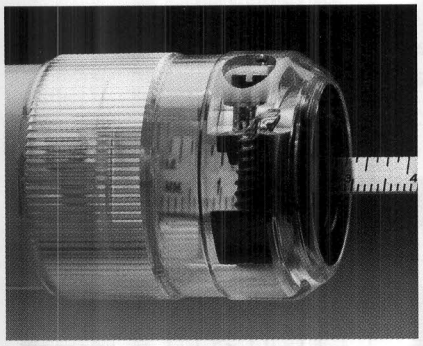


Flanged Outlet	
Part Number	**88030040**
NEMA Type	L6-30R
Color	White
Rating	30A/250VAC
Approvals	UL, CSA



Dimensions in mm

Note: Drawings with plug pins or receptacle slots designated with an "X" or "Y" are 250V max. devices. The X and Y designations are used to indicate that both pins or slots are "hot" in respect to ground (125V potential; when measured from designated pin or slot to ground). Since the X and Y terminals are both supplying power, wire placement is not critical, and thus not specified.



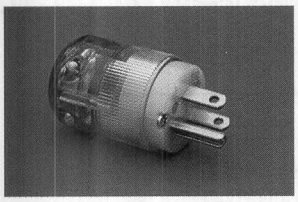
Our medical plugs and connectors are made of exceptionally clear material to permit inspection of terminal connections—in the photo above, you can easily see the tape ruler through the housing. Locking terminals ensure a secure connection.

Hospital Grade Plugs, Connectors, and Receptacles

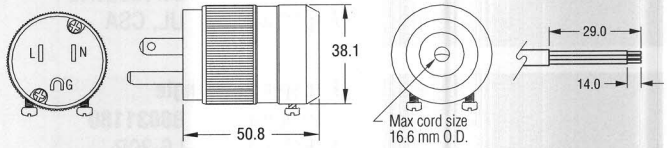
Our hospital-grade plugs, connectors, and receptacles carry the "green dot" signifying that they have been designed and tested for grounding reliability, assembly integrity, strength, and durability. Specifically, they meet or exceed the requirements of UL Standard 498 (Attachment Plugs and Receptacles) and UL 544 (Medical and Dental Equipment) for abrupt plug removal; ground pin retention; fault current; terminal strength; ground contact temperature and resistance; assembly security; cord grip strain relief and cord pull; and various durability and impact tests of the material.

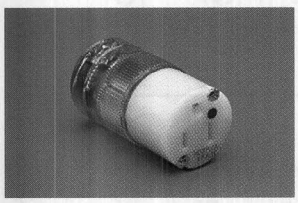
Locking terminals (illustrated on page 88) ensure reliable power connections, which is very important on patient-connected medical equipment.

15A/125V Straight Blade Models

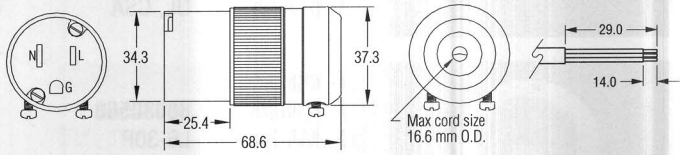


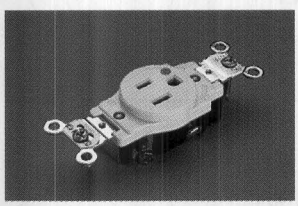
Hospital-Grade Plug	
Part Number	**88030270**
NEMA Type	5-15P
Color	Clear, White
Rating	15A/125VAC
Approvals	UL, CSA



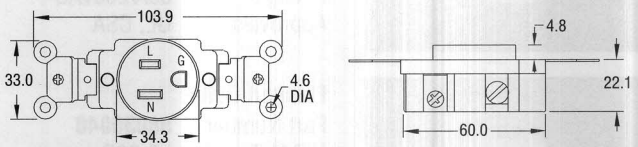


Hospital-Grade Connector	
Part Number	**88030280**
NEMA Type	5-15R
Color	Clear, White
Rating	15A/125VAC
Approvals	UL, CSA

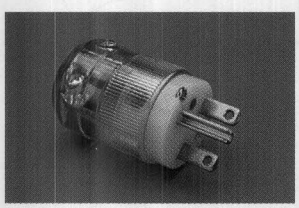




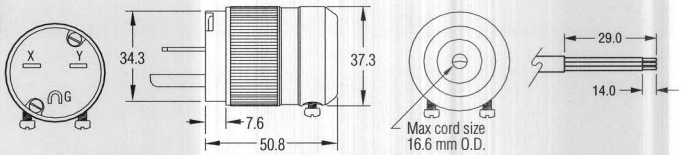
Hospital-Grade Receptacle	
Part Number	**88030290**
NEMA Type	5-15R
Color	Ivory
Rating	15A/125VAC
Approvals	UL, CSA

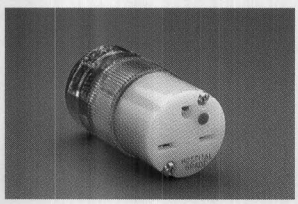


15A/250V Straight Blade Models

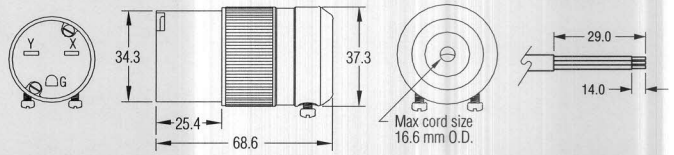


Hospital-Grade Plug	
Part Number	**88030370**
NEMA Type	6-15P
Color	Clear, White
Rating	15A/250VAC
Approvals	UL, CSA





Hospital-Grade Connector	
Part Number	**88030380**
NEMA Type	6-15R
Color	Clear, White
Rating	15A/250VAC
Approvals	UL, CSA



Dimensions in mm

Note: Drawings with plug pins or receptacle slots designated with an "X" or "Y" are 250V max. devices. The X and Y designations are used to indicate that both pins or slots are "hot" in respect to ground (125V potential; when measured from designated pin or slot to ground). Since the X and Y terminals are both supplying power, wire placement is not critical, and thus not specified.

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Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360

Material Specifications

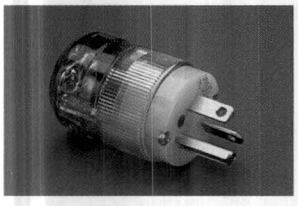
Plugs and Connectors

Front housing: Nylon
Rear housing: Impact-resistant Polycarbonate
UL listed for continuous use: 125°C
UL Flammability Rating: UL 94V-2
Cord clamp: Nylon
Terminal screws: No. 8 solid brass
Terminals and contacts: Locking, lug-type terminals provide superior wire holding.

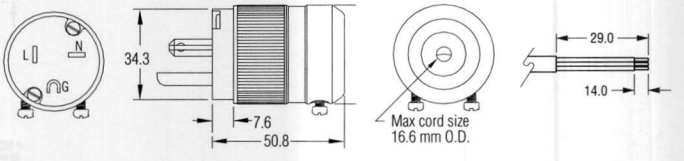
Receptacles

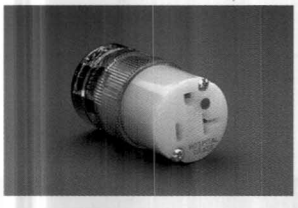
Face and housing: glass-filled Nylon
UL listed for continuous use: 130°C
UL Flammability Index: UL 94V-0
Mounting straps, rivets and grounding strip: solid brass
Terminal clamps and screws: No. 10 solid brass; accepts up to a No. 6 ring terminal
Terminals and contacts: clamp-type terminals provide superior wire holding. Rivetless, 1-piece phosphor bronze contacts eliminate joint resistance.

20A/125V Straight Blade Models

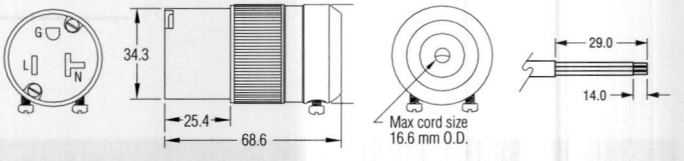


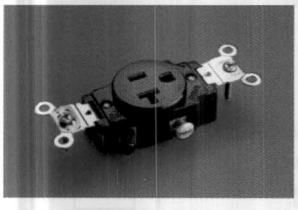
Hospital-Grade Plug	
Part Number	**88030390**
NEMA Type	5-20P
Color	Clear, White
Rating	20A/125VAC
Approvals	UL, CSA



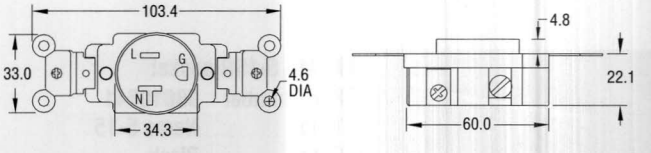


Hospital-Grade Connector	
Part Number	**88030400**
NEMA Type	5-20R
Color	Clear, White
Rating	20A/125VAC
Approvals	UL

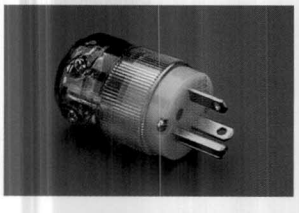




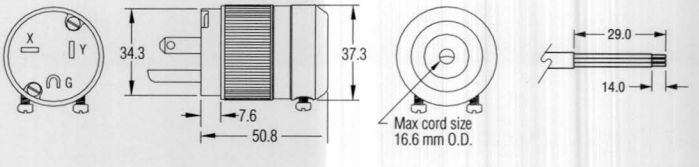
Hospital-Grade Receptacle	
Part Number	**88030580**
NEMA Type	5-20R
Color	Brown
Rating	20A/125VAC
Approvals	UL



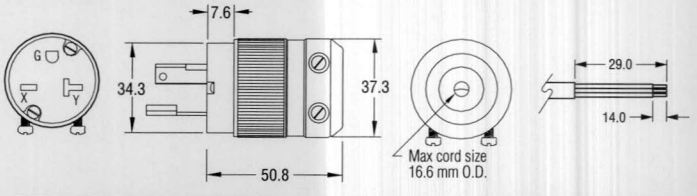
20A/250V Straight Blade Models



Hospital-Grade Plug	
Part Number	**88030410**
NEMA Type	6-20P
Color	Clear, White
Rating	20A/250VAC
Approvals	UL, CSA

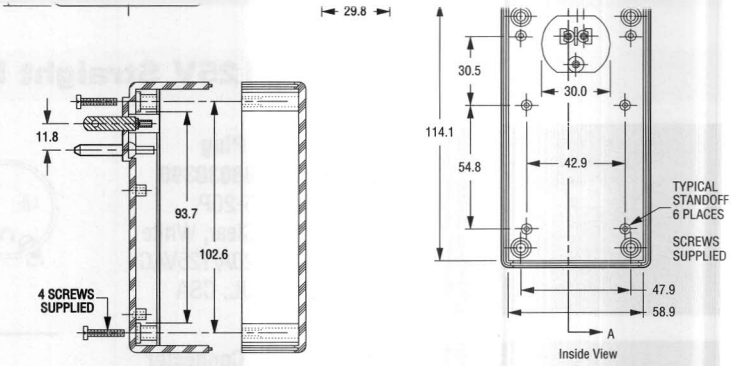


Hospital-Grade Connector	
Part Number	**88030420**
NEMA Type	6-20R
Color	Clear, White
Rating	20A/250VAC
Approvals	UL

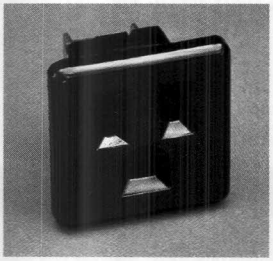


Dimensions in mm

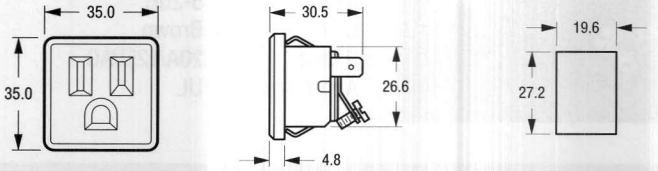
Note: Drawings with plug pins or receptacle slots designated with an "X" or "Y" are 250V max. devices. The X and Y designations are used to indicate that both pins or slots are "hot" in respect to ground (125V potential; when measured from designated pin or slot to ground). Since the X and Y terminals are both supplying power, wire placement is not critical, and thus not specified.



North American Socket (15A/125)



NEMA 5-15R socket	
Part Number	**88010641**
Type	Nema 5-15
Color	Black
Rating	15A/125VAC
Approvals	UL, CSA



Dimensions in mm

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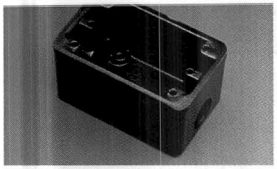
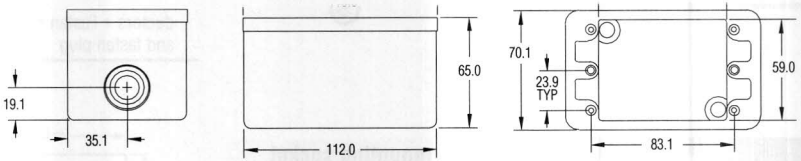
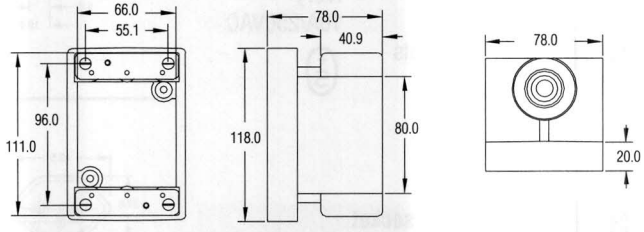


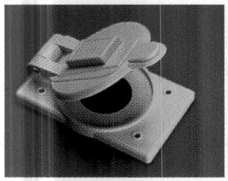
Non-metallic plug box. Black with two 3/4" knockout holes.



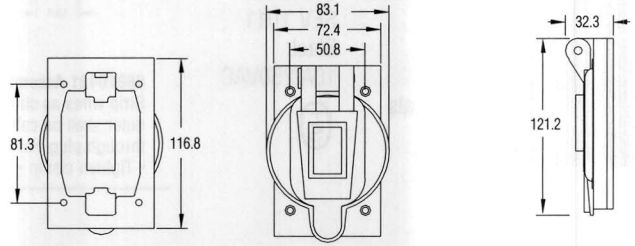
N.A. FD Box and Water-Resistant Cover for 15A, 20A, 30A, & 50A receptacles

88031050:
Yellow FD Box. Fiberglass with two 1" knockout holes.

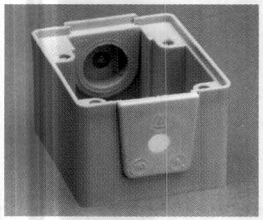




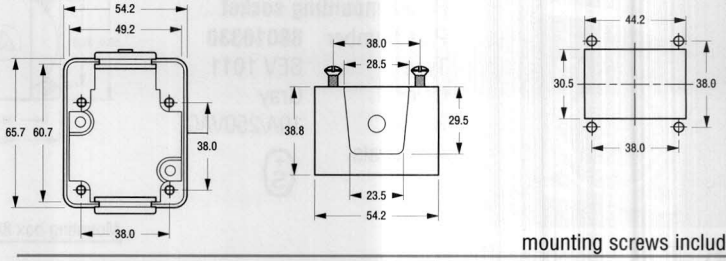
88031060:
Yellow Box Cover. Lexan®; fits single receptacles only.



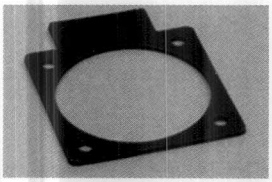
Cont. European Mounting Box



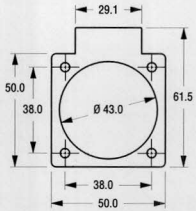
Mounting Box	
Part Number	**88090040**
Type	—
Color	Gray
Rating	—
Approvals	—



mounting screws included



Rubber gasket for mounting box	
Part Number	**88090050**
Type	—
Color	Gray
Rating	—
Approvals	—

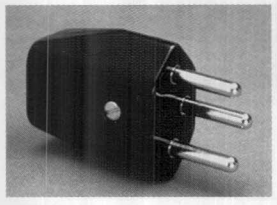


Dimensions in mm

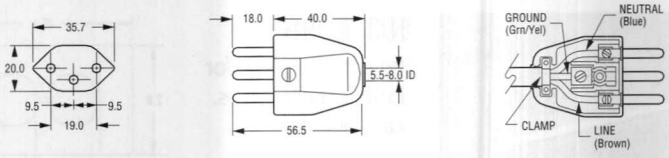
Swiss Plugs & Sockets

In-house made to order assembly services available (see pages 75-86) or contact our Customer Service Department toll free at the numbers below.

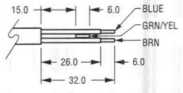
Swiss Plug & Socket (10A)



Plug	
Part Number	**88010732**
Type	SEV 1011
Color	Black
Rating	10A/250VAC
Approvals	



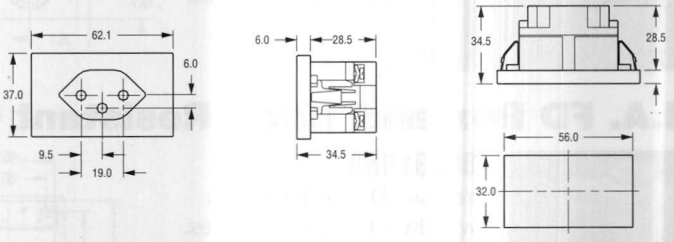
88010732 Assembly Instructions
Strip wires as shown • Open plug • Loosen cable clamp • Connect conductors • Fasten cable clamp • Close and fasten plug

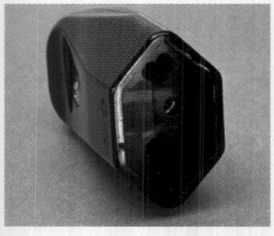


Max. cable size: 3x1.50mm²

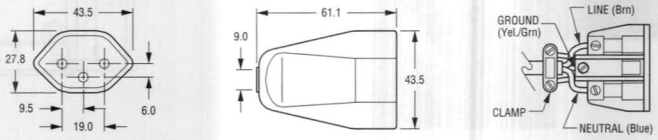
See page 237 for socket strip

Push-in mounting socket	
Part Number	**88010530**
Type	SEV 1011
Color	Ivory
Rating	10A/250VAC
Approvals	

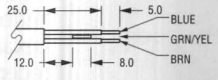


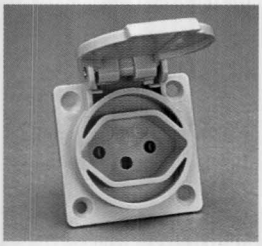


In-line socket	
Part Number	**88010431**
Type	SEV 1011
Color	Black
Rating	10A/250VAC
Approvals	

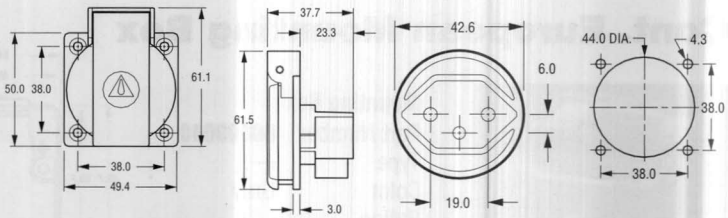


88010431 Assembly Instructions
Strip wires as shown • Open plug • Slide outer shell on cable • Slide prepared cable through plug clamp • Connect conductors • Tighten clamp • Reassemble plug





Panel-mounting socket	
Part Number	**88010330**
Type	SEV 1011
Color	Gray
Rating	10A/250VAC
Approvals	



IP X4 "splashproof"

Mounting box 88090040 page 111

Dimensions in mm

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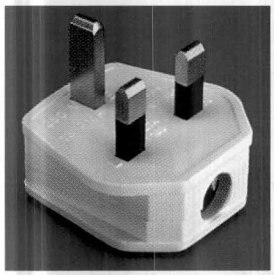
Fax toll-free: (800) 645-5360

United Kingdom Plugs & Sockets

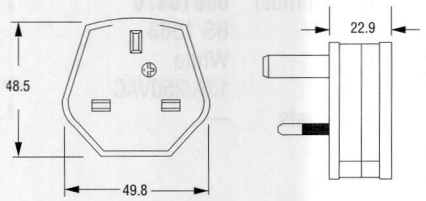
Line and neutral contacts of socket are shuttered to minimize accidental entry of an object other than mating plug.

United Kingdom Plug & Socket (13A)

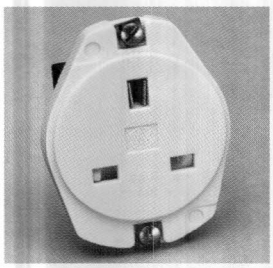


Also available in black (88040021). Plug with integral 13-amp fuse. See page 217 for replacement fuses.

Plug	
Part Number	**88040011**
Type	BS 1363
Color	White
Rating	13A/250VAC
Approvals	

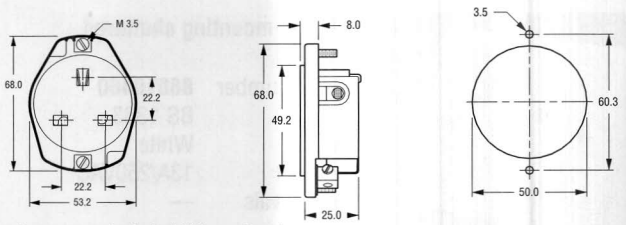


88040011 & 88040021 Assembly Instructions
Strip all three wires as shown • Open back • Remove fuse • Press cord between grip before connecting conductors to terminals • Connect conductors • Replace fuse • Replace back

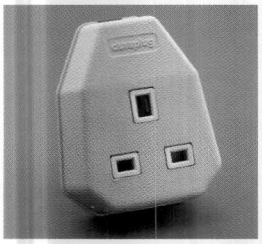


See page 237 for socket strips.

Panel-mounting shuttered socket	
Part Number	**88010621**
Type	BS 1363
Color	White
Rating	13A/250VAC
Approvals	—

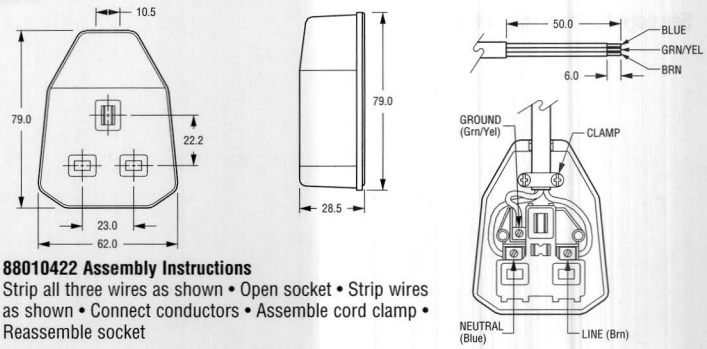


mounting screws included (14 mm long)

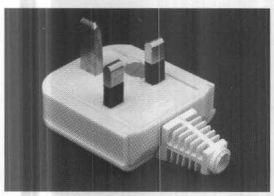


Line & neutral contacts are shuttered

In-line shuttered socket	
Part Number	**88010422**
Type	BS 1363
Color	White
Rating	13A/250VAC
Approvals	—

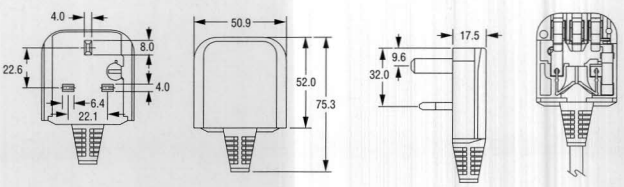


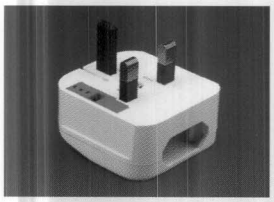
88010422 Assembly Instructions
Strip all three wires as shown • Open socket • Strip wires as shown • Connect conductors • Assemble cord clamp • Reassemble socket



Also available in black

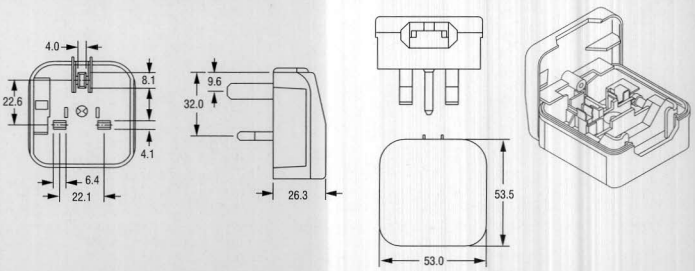
Non-rewirable plug	
Part Number	**88050020**
Type	BS 1363
Color	White
Rating	13A/250VAC
Approvals	—





Also available in black (88050030)

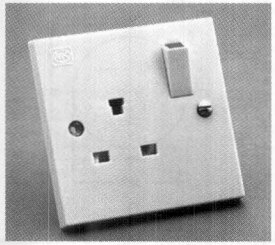
Europlug Converter	
Part Number	**88050010**
Type	BS 1363
Color	White
Rating	13A/250VAC
Approvals	—



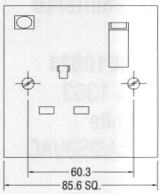
Dimensions in mm

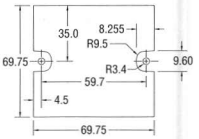
Also available in black (88040021).
Plug with integral 13-amp fuse. See page 217 for replacement fuses.

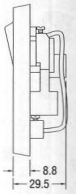
Strip all three wires as shown • Open back • Remove fuse • Press cord between grip before connecting conductors to terminals • Connect conductors • Replace fuse • Replace back



Panel-mounting shuttered socket	
Part Number	**88010460**
Type	BS 1363
Color	White
Rating	13A/250VAC
Approvals	—







mounting screws included

Dimensions in mm

See page 237 for socket strips.

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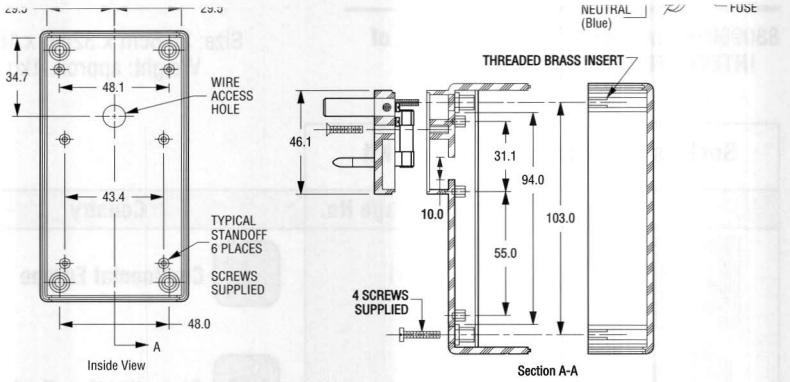
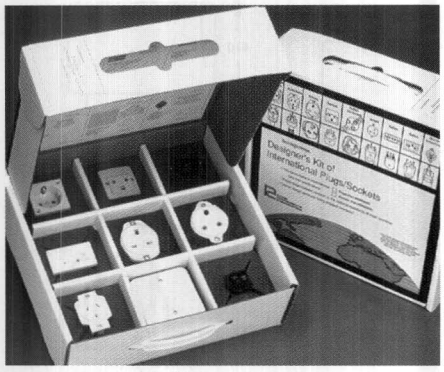


Dimensions in mm

Designer's Kits of International Plugs/Sockets



88090030: Interpower™ Designer's Kit of INTERNATIONAL SOCKETS*

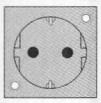
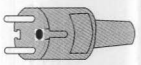
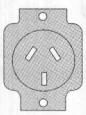
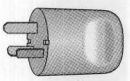
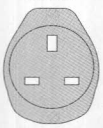
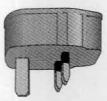
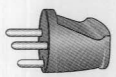
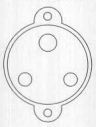
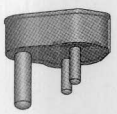
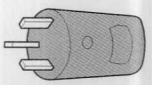
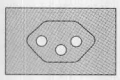
FEATURES:

- Nine conveniently packaged international sockets (or nine international plugs) commonly used worldwide.
- Use sockets and plugs when designing electrical and electronic equipment that will be exported with foreign power cords and cordsets.
- Use sockets in test and burn-in setups.

For a listing of where these plugs and sockets are used, see fold-out poster in the Designer's Reference Section.

Size: 30.5cm x 32cm x 10cm
Weight: approx. 1kg

88090020: Interpower™ Designer's Kit of INTERNATIONAL PLUGS*

Sockets included in the Socket Kit				Plugs included in the Plug Kit		
	Part Number	Page No.	Country	Part Number	Page No.	
	88010610	91	A Continental Europe	88010801	90	
	88010512	93	C Australia/ New Zealand	88010713	94	
	88010621	113	D United Kingdom/ Ireland	88040011	113	
	88010541	95	E Denmark	88010741	95	
	88010561	96	G India	88010763	96	
	88010580	96	H Israel	88010780	96	
	88010572	97	I Italy	88010771	97	
	88010530	112	L Switzerland	88010732	112	
	88010641	110	K North America (NEMA 5-15)	88030100	98	

* Panel Components reserves the right to substitute part numbers to reflect product changes; substitution is sometimes necessary to update product approvals or to change manufacturers to improve delivery times.

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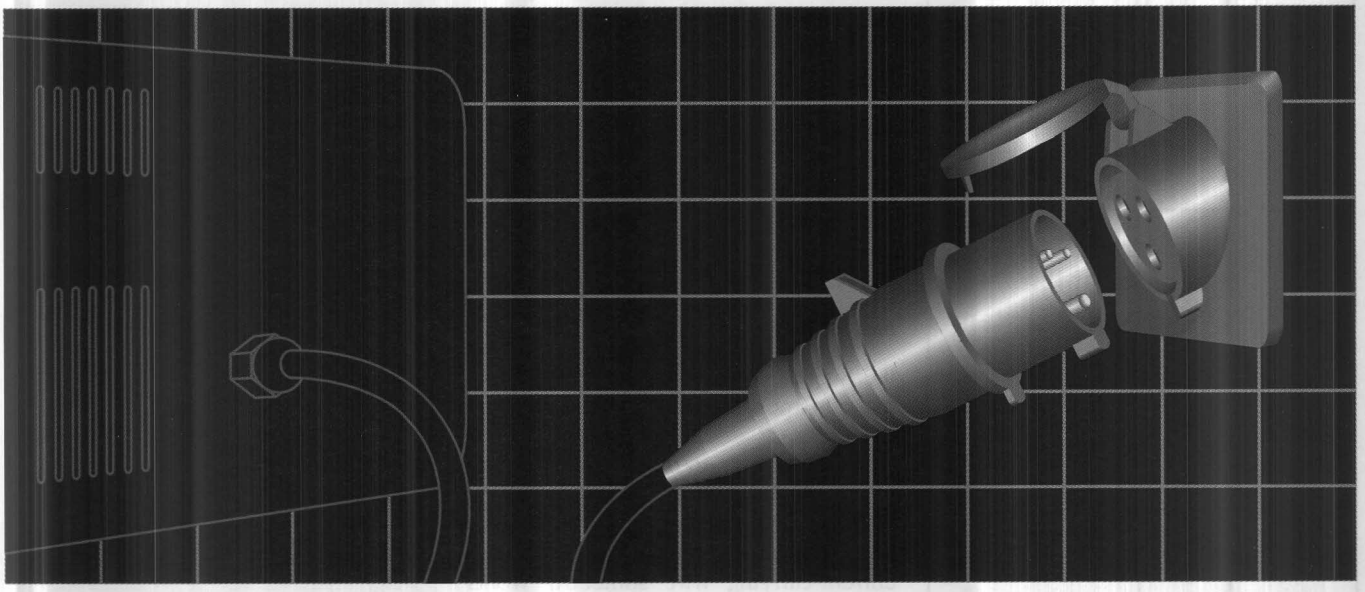
High Power Connections



Most of the products that we use each day at home and at work have standard plugs for power entry. In North America, the most common plug is a NEMA 5-15P which is rated at 15A/120VAC. There are several international plug standards, such as the widely utilized German-style CEE 7, used at a variety of ratings up to 16A/250VAC.

How do you provide power to your product when it draws more than the rated output of common plugs and sockets? High power connectors made to specific national standards can also be found. They are not very good choices unless sales are limited to a few markets. Plug configurations made for one country and being used in another country, in most cases, would not be acceptable. For example, the higher power straight blade and twist lock NEMA plugs used in North America can not be used in Europe.

Now there is another way to make high power hookups. **IEC publication 60309*** defines a family of connectors, (including plugs, socket-outlets, and couplers for industrial purposes), that can be used on equipment going to both domestic and international markets. It is no longer necessary to stock connectors for every national standard. With a minimum investment, hard wiring can be avoided.

IEC 60309* connectors carry ratings up to 690VAC and 125 amps at frequencies of 50Hz and above. There are models for both single- and three-phase systems. Note that the Interpower™ line of IEC 60309* connectors in this catalog carries approvals by VDE/SEMKO, UL, and CSA.

Maximum Rating of Standard Power Plugs Worldwide

Country	Amperage	Voltage
Australia/N.Z.	10-15	240
Austria	16	230
Canada	15	120
Denmark	10	230
Finland	16	230
France/Belgium	16	230
Italy	16	230
Netherlands	16	230
Norway	10	230
Sweden	16	230
Switzerland	10	230
U.K./Ireland	13	230
United States	15	120
Germany	16	230

In many countries, plug standards have been defined with higher ratings than those listed here, but they are not readily available to equipment exporters in North America. The ratings listed at left should be considered the practical limits of standard plug and socket combinations.

Please note that in North America several high power plugs and sockets have been defined—see the NEMA plugs and sockets beginning on page 98. NEMA plugs and sockets are not used outside of North America.

Detachable High Power Products... A Marketing Advantage

Makers of high powered products can now offer customers more flexibility and convenience. Some of the advantages of lower powered equipment can be made available with products that consume more power.

More and more, power-hungry equipment fits in relatively small packages. Users can wheel products that were once stationary to individual work stations and plug them in. This mobility extends the productivity of users by giving them sole control over more powerful equipment. It also increases equipment usage, thus giving your customers a greater return on investment. Flexibility such as this can give your products a competitive edge.

Some stationary equipment can also benefit from using IEC 60309* connectors. These products could be sold, in part, on the basis of how easy they are to install. In this case, specifications for the mating wall outlet and wiring instruction could

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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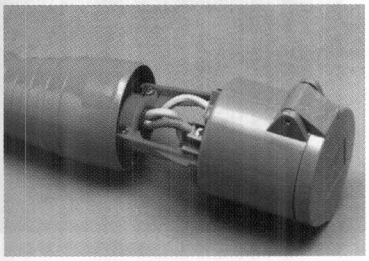
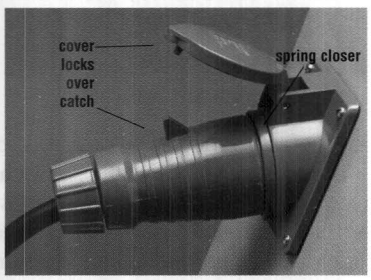
IEC 60309* Voltage Ranges, Contact Configurations, Color Codes			
	125-250VAC	230VAC	400VAC
Single-Phase, 3-Wire	4h	6h	
Three-Phase Wye, 5-Wire			6h

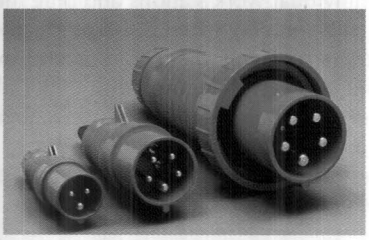
Advantages of the IEC60309*Connector System



With an all-plastic, impact-resistant shell and latching system, IEC 60309* connectors offer important safety advantages over metal-shelled devices. Interpower™ models feature an internal strain relief which secures wiring connections and discourages tampering.



IEC 60309* sockets incorporate a snap cover which serves as a locking mechanism to keep mating pairs securely engaged. The cover snaps closed when connector is removed and protects against insertion of foreign objects.



IEC 60309* connectors utilize keys and keyways, unique ground contact sizes and configurations, and differing shell diameters to prevent mismating of connectors with different voltage and current ratings.

be sent to the customer in advance. This wall socket might also be provided to the customer as an extra-cost accessory. The customer would then be instructed to have the outlet installed by an electrician prior to the equipment installation date. At that time, your product is simply plugged in and powered up. This procedure should eliminate one source of headaches, delays, and distractions for the installation team. This, in turn, should help control costs and gain higher customer satisfaction.

Advantages of IEC 60309* Connectors

IEC 60309* plugs and sockets have shells made of impact resistant plastic. The only metallic parts are the contacts themselves and the fasteners used to hold the various pieces of the plug and socket together. Plastic offers important safety advantages over metal in connector shells. If a current-carrying wire somehow works loose from its contact, a person handling a metal connector could get a lethal shock. You can't receive such a shock from a correctly assembled plastic connector.

This system has been designed to avoid mismating. Users can not hook up a connector that has one voltage or current rating with one that has other ratings. The plastic shells include a polarizing key and keyway, and the diameter of the ground contact is greater than that of the other contacts. A unique relationship between the ground contact and the outer shell keyway determines the voltage range of each family of connectors.

Since this relationship is internal, it is not readily apparent to the user. Color coded shells make the voltage ranges obvious. The table above, left, shows these color codes and configurations. Additionally, the IEC 60309* system features a series of graduated connector sizes. Each size relates to the current rating and number of contacts.

IEC 60309* sockets feature hinged, spring-loaded covers which snap into place when the plug is removed. This reduces the risk that foreign objects will be inserted into the contacts. The hinged cover also serves as a locking mechanism to assure that once the plug and socket are mated they will not be accidentally uncoupled.

Models in this connector family come with seals that control the intrusion of moisture. This is reflected in an "IP" rating, which is derived from IEC 60529*. Interpower™ IEC 60309* connectors are rated either IP X4 (splash resistant) or IP X7 (watertight or splash/proof). The symbol for the IP rating is embossed on each connector. (Look below at chart.)

Symbol	IP Rating	Sealing Effectiveness
	IP X4	Splash resistant
	IP X7	Water tight, splashproof

See page 263

Interpower™ connectors carry UL, CSA, and VDE

Our line of IEC 60309* connectors carries UL listing, CSA certification, and VDE (German) or SEMKO (Swedish) approval. These models make it possible to design and stock one part to meet both North American and international requirements, cutting down on the number of inventory items that you will need to meet worldwide markets.

Unfortunately, there is no single worldwide cordage standard, so it is still necessary to utilize AWG cordage for North American applications and harmonized metric cordage for international applications. VDE will permit the use of UL/CSA internal hookup wire on the panel-mounting models, as long as the hookup wire is rated at the correct amperage.

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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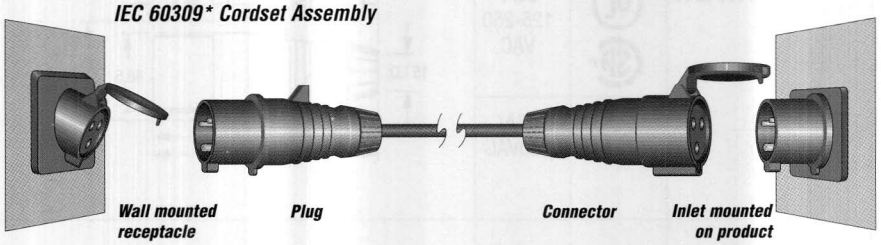
Standard cable assemblies— usually available from stock

Panel Components Corporation can assemble IEC 60309* connectors into power cords and cordsets to meet your requirements. Cord assemblies are fully tested and ready for shipment. Typical assemblies are described and illustrated below. Note that assemblies for international markets will utilize harmonized cordage; assemblies for North American markets will utilize AWG cordage. For more information please call our Customer Service Department at (800) 662-2290.

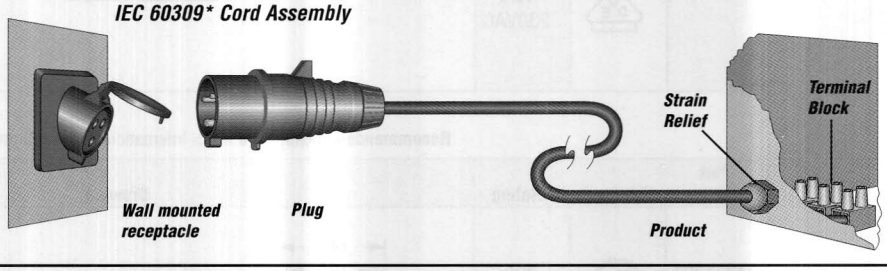
IEC 60309* Cordset Assembly: This cordset (see diagram below) is terminated with a male and female connector on opposite ends of the cord. The user must have the correct socket wired into the branch circuit near the installation site, and your equipment must be fitted with the mating male inlet. The components of this system make this an expensive solution, although it may save your customer some expense for electrical installation.

IEC 60309* Cordset Assembly



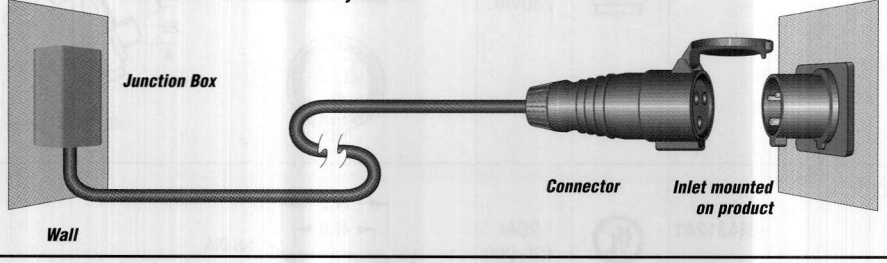
IEC 60309* Cord: This power cord (see diagram below) is terminated with a plug on one end and stripped conductors on the other. We can prepare the conductors to meet your requirements for attachment to your equipment. As with cordsets, your customer must have the correct socket wired into the branch circuit near the installation site. This solution is less expensive than a cordset, but, in mobile installations, a power cord can be awkward and possibly hazardous when the equipment is moved.

IEC 60309* Cord Assembly



IEC 60309* Connector Cord: Connector cords (see diagram below) have a female connector on one end and stripped conductors on the other. The termination options are the same as those available for power cords. These cords would be permanently wired to a junction box by an electrician on your customer's site. Your equipment must be fitted with a mating male inlet connector.

IEC 60309* Cord Assembly



Cord Test Procedures—IEC 60309* assemblies are tested as follows:

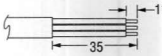
1. Correct polarity, correct continuity, absence of opens, absence of shorts.
2. 25A Ground Integrity Test for a duration of 1.5 seconds.
3. Dialectric strength test of 2500 VAC for at least one second between every combination of conductor pairs.

Sample Tests:

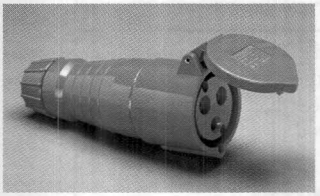
1. Strain relief test: Assembled connectors are subjected to a force of 30 lb. for one minute. A visual inspection must confirm that the cordage has not slipped in the connector strain relief.
2. Length is verified.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

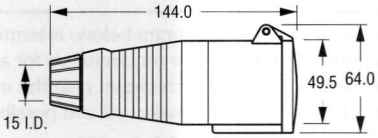
			230VAC	

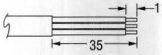


Cable-mounting connector



84331211	UL, CSA	20A/ 125-250 VAC
	VDE	16A/ 230VAC

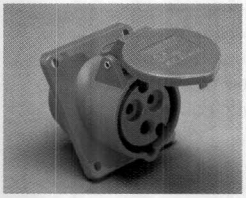


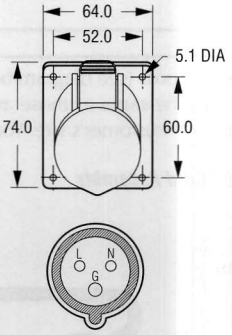


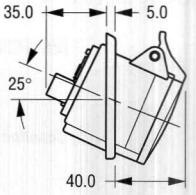
Panel mount

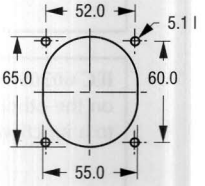
Recommended hookup wire size: International: 3x1.50mm², North American: 3x14AWG.

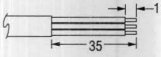
Style	Part Number	Approvals	Rating	Drawings
Panel-mounting receptacle	**84231201**	UL, CSA	20A/ 125-250 VAC	
		VDE	16A/ 230VAC	



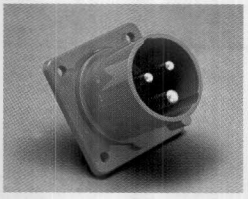




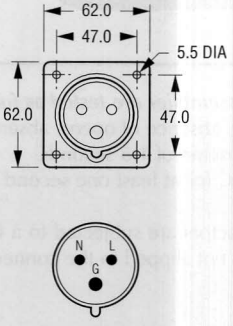


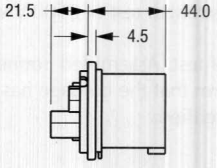


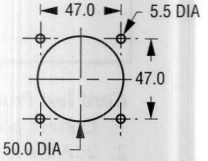
Cable-mounting connector

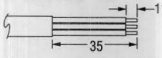


84431241	UL, CSA	20A/ 125-250 VAC
	S	16A/ 230VAC









Dimensions are in mm

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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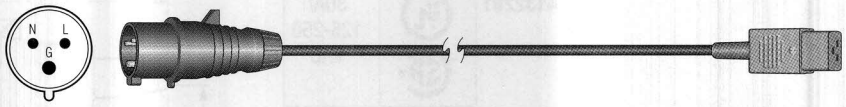
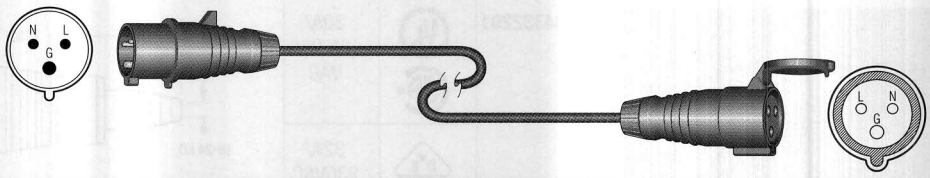
International Assemblies–16A, 3 pin (Single-Phase)

The assemblies below utilize international harmonized cordage: if you require a UL/CSA assembly with AWG cordage, please contact us.

Standard Cordset Assemblies

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87510010	16A 230VAC single-phase	Blue	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	**Cordage Size & Type**	**Connector Part Number**
84131211	3x1.5mm² (PVC)	83011380

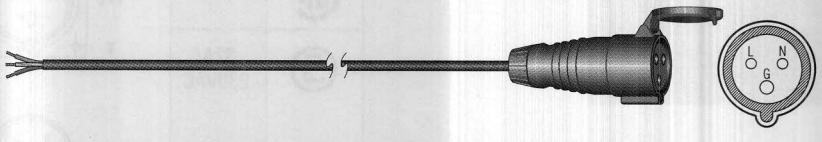
Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
86833208	16A 230VAC single-phase	Blue	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	**Cordage Size & Type**	**Connector Part Number**
84131211	3x1.5mm² (PVC)	84331211

Standard Cord Assemblies

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87510020	16A 230VAC single-phase	Blue	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	**Cordage Size & Type**	**Jacket & Conductor Strip**
84131211	3x1.5mm² (PVC)	50mm/10mm

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87510030	16A 230VAC single-phase	Blue	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Jacket & Conductor Strip	**Cordage Size & Type**	**Connector Part Number**
50mm/10mm	3x1.5mm² (PVC)	84331211

Interpower™ IEC 60309* high power connectors

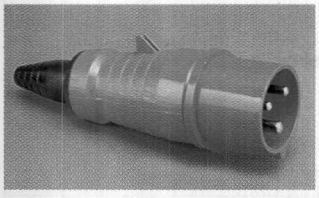
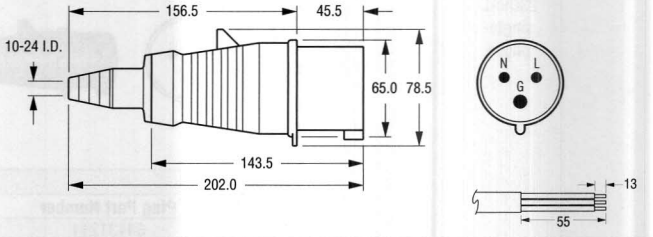
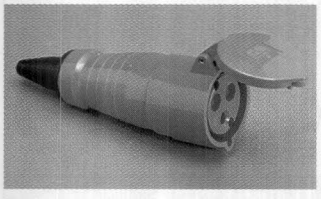
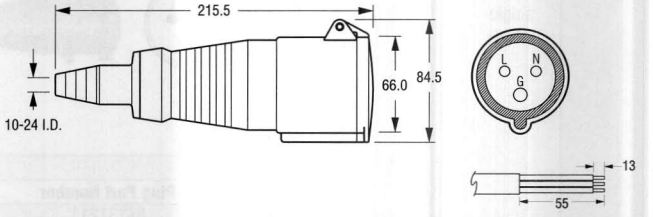
IP X4 "splash resistant"

30/32A, 3 pin (Single-Phase)

SPECIFICATIONS—Housing color code: Blue. Materials: Body molded of UL 94-V2 impact-resistant thermoplastic (Polyamide 6). Temp. range: -25°C to +140°C. Manufactured to IEC 60309*; DIN 49462/63; VDE 0623; CEE 17; BS 4343. See page 130 for torque requirements and approval file numbers.

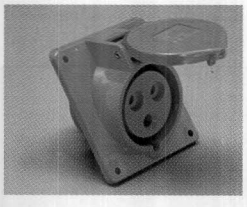
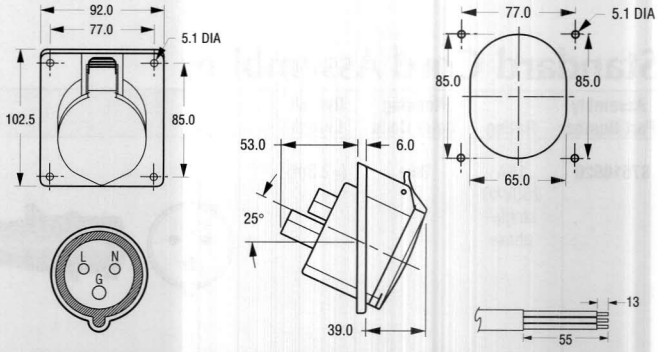
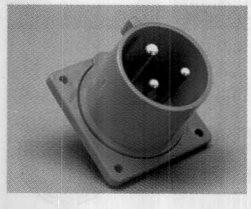
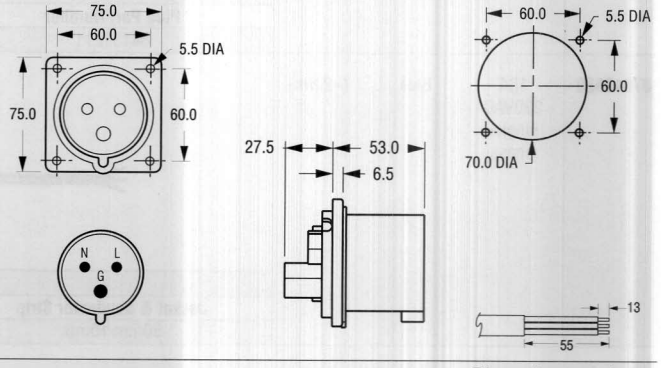
Cable mount

Recommended cordage: International—3x4.0mm², 32A, (86020320); North American—3x8AWG, 40A, (86010630); see page 133.

Style	Part Number	Approvals	Rating	Drawings
Cable-mounting plug 	84132201	UL, CSA	30A/ 125-250 VAC	
		VDE	32A/ 230VAC	
Cable-mounting connector 	84332201	UL, CSA	30A/ 125-250 VAC	
		VDE	32A/ 230VAC	

Panel mount

Recommended hookup wire size: International: 3x4.0mm², North American: 3x8AWG.

Style	Part Number	Approvals	Rating	Drawings
Panel-mounting receptacle 	84232201	UL, CSA	30A/ 125-250 VAC	
		VDE	32A/ 230VAC	
Cable-mounting inlet 	84432241	UL, CSA	30A/ 125-250 VAC	
		S	32A/ 230VAC	

Dimensions are in mm

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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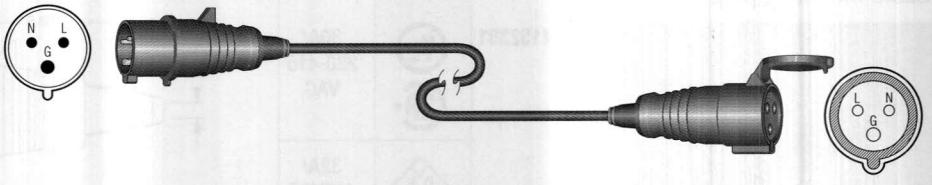
International Assemblies–32A, 3 pin (Single-Phase)

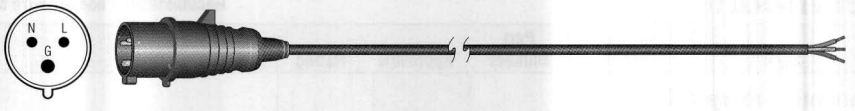
The assemblies below utilize international harmonized cordage; if you require a UL/CSA assembly with AWG cordage, please contact us.

Standard Cordset Assembly

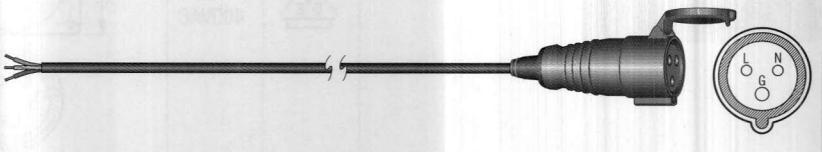
Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87520040	32A 230VAC single-phase	Blue	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	Cordage Size & Type	Connector Part Number
84132201	3x4.0mm² (rubber)	84332201

Standard Cord Assemblies

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87520050	32A 230VAC single-phase	Blue	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	Cordage Size & Type	Jacket & Conductor Strip
84132201	3x4.0mm² (rubber)	50mm/10mm

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87520060	32A 230VAC single-phase	Blue	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Jacket & Conductor Strip	Cordage Size & Type	Connector Part Number
50mm/10mm	3x4.0mm² (rubber)	84332201

Interpower™ IEC 60309* high power connectors

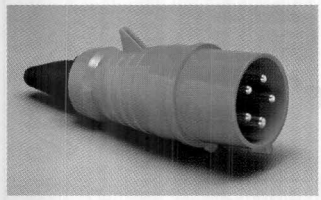
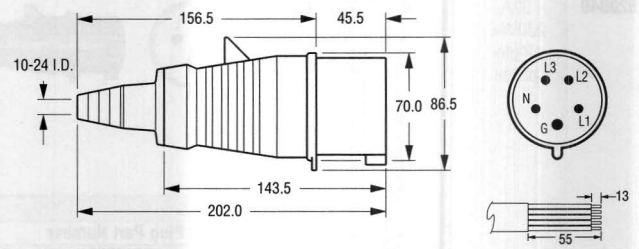
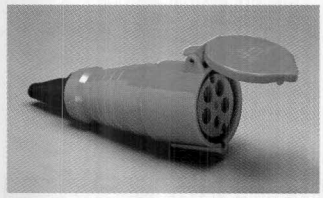
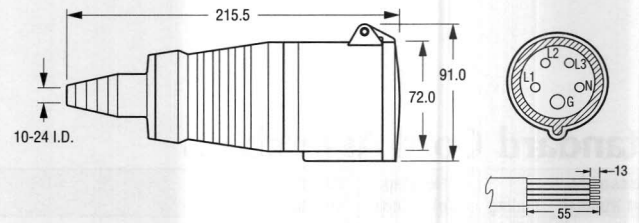
IP X4 "splash resistant"

30/32A, 5 pin (Three-Phase)

SPECIFICATIONS—Housing color code: Red. Materials: Body molded of UL 94-V2 impact-resistant thermoplastic (Polyamide 6). Temp. range: -25°C to +140°C. Manufactured to IEC 60309*; DIN 49462/63; VDE 0623; CEE 17; BS 4343. See page 130 for torque requirements and approval file numbers.

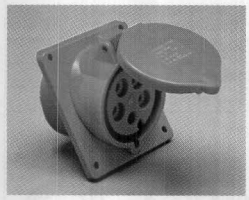
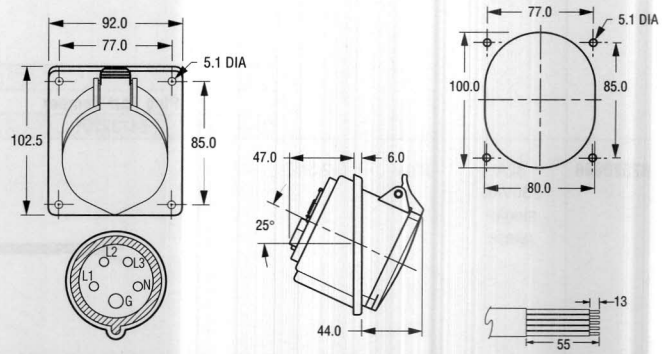
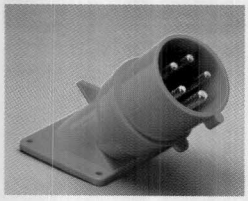
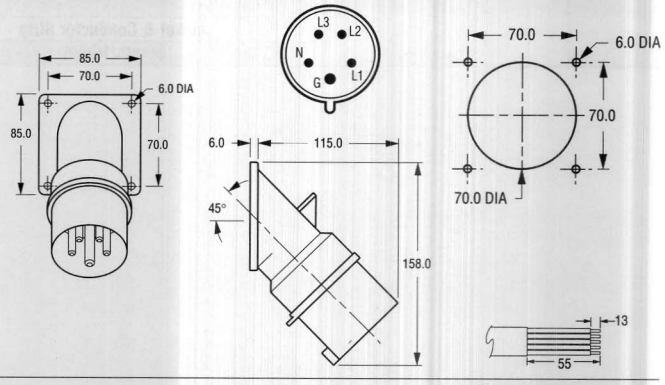
Cable mount

Recommended cordage: International—5x6.0mm², 44A, (86020430); North American—5x8AWG, 28A, (86010670); see page 133.

Style	Part Number	Approvals	Rating	Drawings
Cable-mounting plug 	84152301	UL, CSA	30A/ 220-415 VAC	
		VDE	32A/ 400VAC	
Cable-mounting connector 	84352301	UL, CSA	30A/ 220-415 VAC	
		VDE	32A/ 400VAC	

Panel mount

Recommended hookup wire size: International: 5x6.0mm², North American: 5x8AWG.

Style	Part Number	Approvals	Rating	Drawings
Panel-mounting receptacle 	84252301	UL, CSA	30A/ 220-415 VAC	
		VDE	32A/ 400VAC	
Cable-mounting inlet 	84452301	UL, CSA	30A/ 220-415 VAC	
		VDE	32A/ 400VAC	

Dimensions are in mm

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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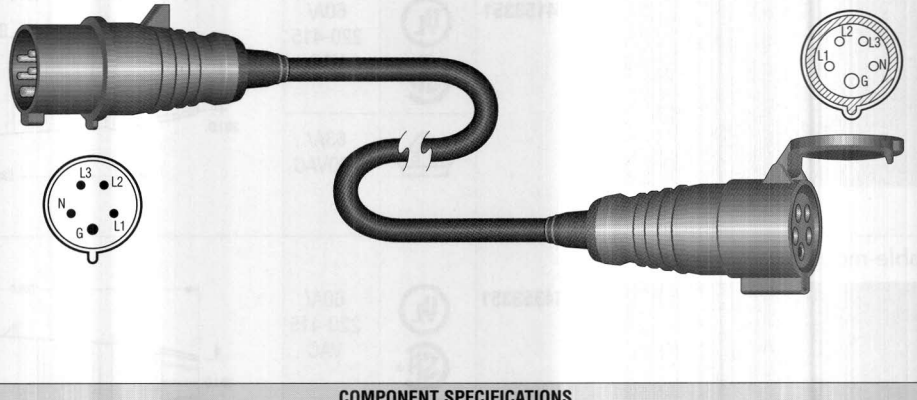
International Assemblies–32A, 5 pin (Three-Phase)

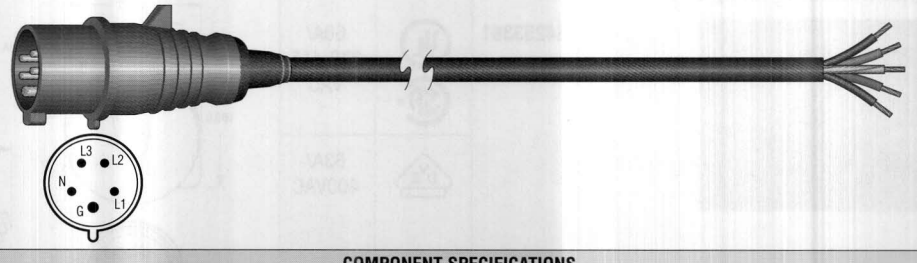
The assemblies below utilize international harmonized cordage; if you require a UL/CSA assembly with AWG cordage, please contact us.

Standard Cordset Assembly

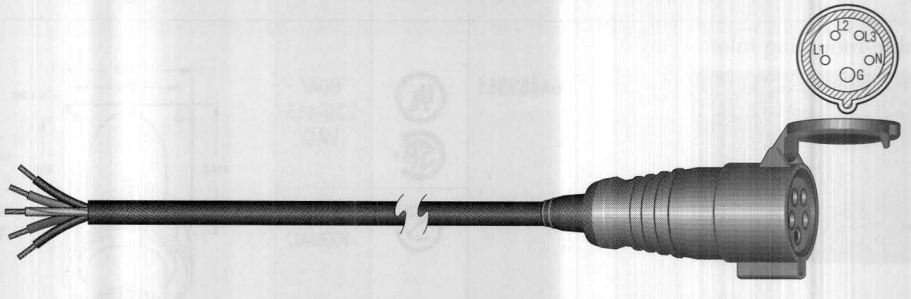
Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87530010	32A 400VAC three-phase	Red	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	**Cordage Size & Type**	**Connector Part Number**
84152301	5x6.0mm² (rubber)	84352301

Standard Cord Assemblies

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87530020	32A 400VAC three-phase	Red	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	**Cordage Size & Type**	**Jacket & Conductor Strip**
84152301	5x6.0mm² (rubber)	50mm/10mm

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87530030	32A 400VAC three-phase	Red	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Jacket & Conductor Strip	**Cordage Size & Type**	**Connector Part Number**
50mm/10mm	5x6.0mm² (rubber)	84352301

Interpower™ IEC 60309* high power connectors

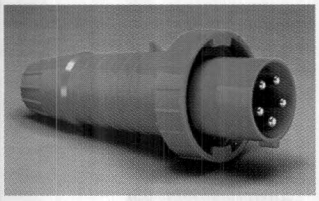
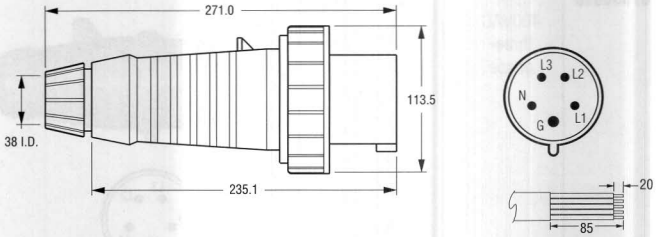
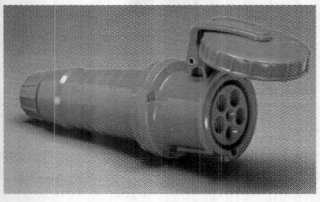
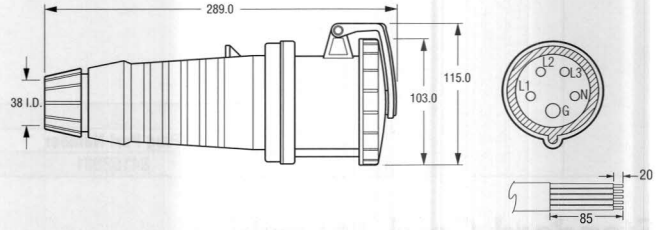
IP X7 "water tight/splashproof"

60/63A, 5 pin (Three-Phase)

SPECIFICATIONS—Housing color code: Red. Materials: Body molded of UL 94-V2 impact-resistant thermoplastic (Polyamide 6). Temp. range: -25°C to +140°C. Manufactured to IEC 60309*; DIN 49462/63; VDE 0623; CEE 17; BS 4343. See page 130 for torque requirements and approval file numbers. ***[Please see note bottom of page 128 about the center pin.]***

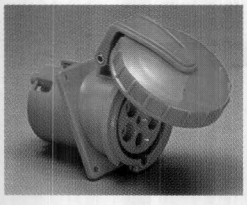
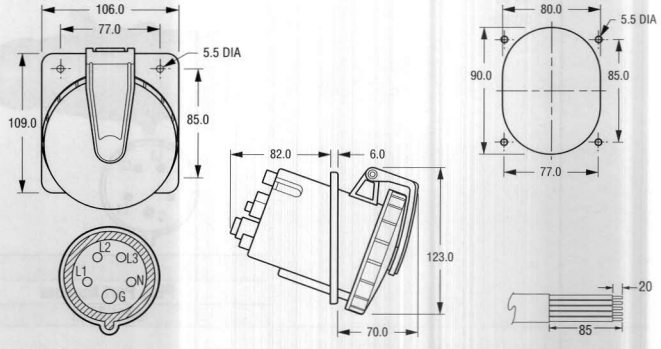
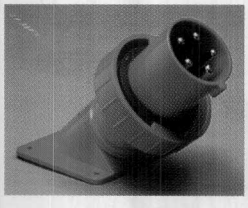
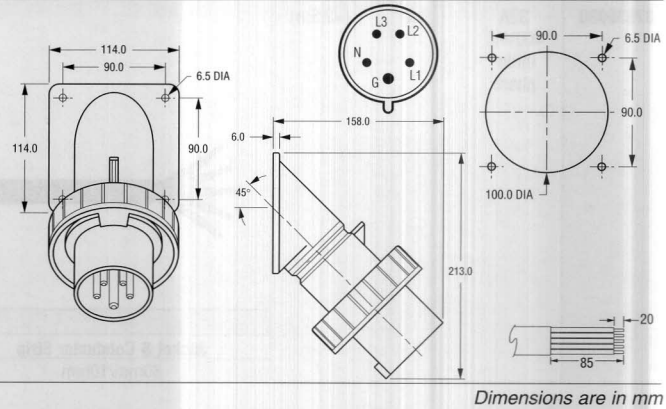
Cable mount

Recommended cordage: International—5x10.0mm², 61A, (86020440); North American—5x4AWG, 48A, (86010690); see page 133.

Style	Part Number	Approvals	Rating	Drawings
Cable-mounting plug 	84153351	UL, CSA	60A/ 220-415 VAC	
		VDE	63A/ 400VAC	
Cable-mounting connector 	84353351	UL, CSA	60A/ 220-415 VAC	
		VDE	63A/ 400VAC	

Panel mount

Recommended hookup wire size: International: 5x10.0mm², North American: 5x4AWG.

Style	Part Number	Approvals	Rating	Drawings
Panel-mounting receptacle 	84253361	UL, CSA	60A/ 220-415 VAC	
		VDE	63A/ 400VAC	
Cable-mounting inlet 	84453351	UL, CSA	60A/ 220-415 VAC	
		S	63A/ 400VAC	

Dimensions are in mm

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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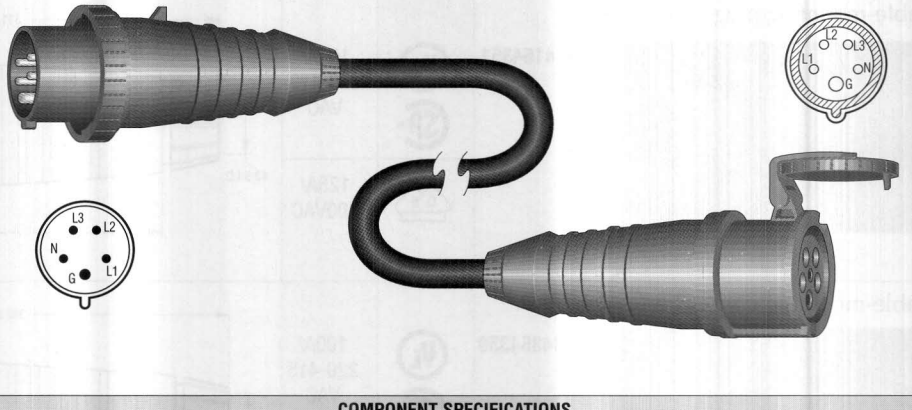
International Assemblies–63A, 5 pin (Three-Phase)

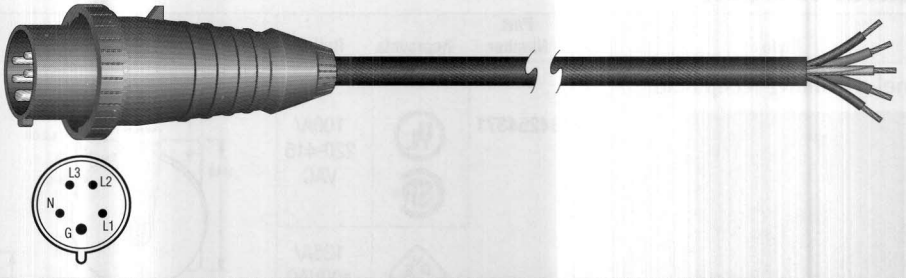
The assemblies below utilize international harmonized cordage; if you require a UL/CSA assembly with AWG cordage, please contact us.

Standard Cordset Assembly

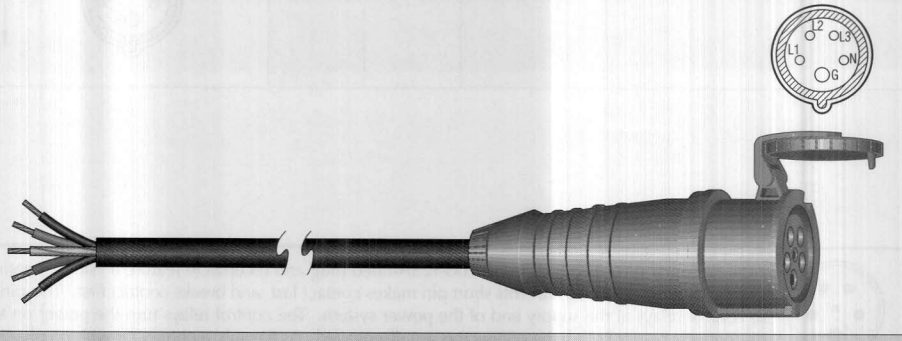
Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87540010	63A 400VAC three-phase	Red	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	**Cordage Size & Type**	**Connector Part Number**
84153351	5x10.0mm² (rubber)	84353351

Standard Cord Assemblies

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87540020	63A 400VAC three-phase	Red	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	**Cordage Size & Type**	**Jacket & Conductor Strip**
84153351	5x10.0mm² (rubber)	50mm/10mm

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87540030	63A 400VAC three-phase	Red	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Jacket & Conductor Strip	**Cordage Size & Type**	**Connector Part Number**
50mm/10mm	5x10.0mm² (rubber)	84353351

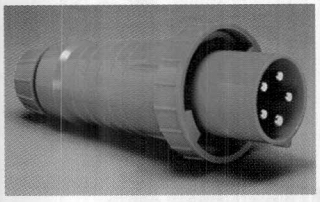
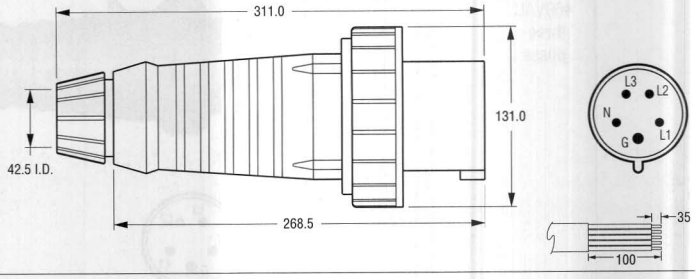
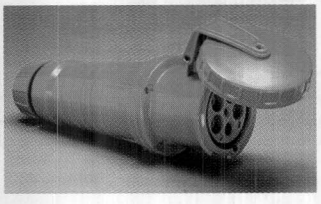
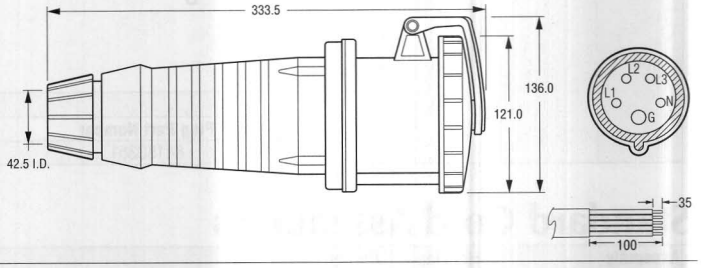
Interpower™ IEC 60309* high power connectors **IP X7** **"water tight/splashproof"**

100/125A, 5 pin (Three-Phase)

SPECIFICATIONS—Housing color code: Blue. Materials: Body molded of UL 94-V2 impact-resistant thermoplastic (Polyamide 6). Temp. range: -25°C to +140°C. Manufactured to IEC 60309*; DIN 49462/63; VDE 0623; CEE 17; BS 4343. See page 130 for torque requirements and approval file numbers. ***[See note bottom of page about the center pin.]***

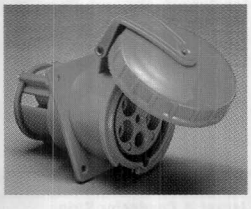
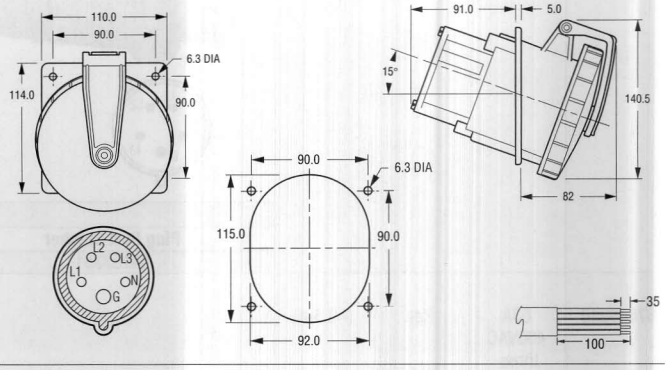
Cable mount

Recommended cordage: International—5x35.0mm², 135A, (86020500, page 135); North American—5x2AWG, 64A, (86010700); see page 133.

Style	Part Number	Approvals	Rating	Drawings
Cable-mounting plug 	**84154351**	UL, CSA	100A/ 220-415 VAC	
		VDE	125A/ 400VAC	
Cable-mounting connector 	**84354350**	UL, CSA	100A/ 220-415 VAC	
		VDE	125A/ 400VAC	

Panel mount

Recommended hookup wire size: International: 5x35.0mm², North American: 5x2AWG.

Style	Part Number	Approvals	Rating	Drawings
Panel-mounting receptacle 	**84254371**	UL, CSA	100A/ 220-415 VAC	
		VDE	125A/ 400VAC	

Dimensions are in mm

Note re center pin: The 60/63 and 100/125A-rated plug and receptacle feature a "safety interlock" which uses a center pin on the plug that is shorter than the "main" pins. This short pin makes contact last, and breaks contact first. This pin may be connected to a control line and, in turn, to control relays at the supply end of the power system. The control relays turn the power on to the conductors when the short pin mates, and disconnects power before the connectors are disengaged. As a result, a connector with no plug installed could be wired so that no voltage would be present, and arcing would be avoided during connector engagement and disengagement.

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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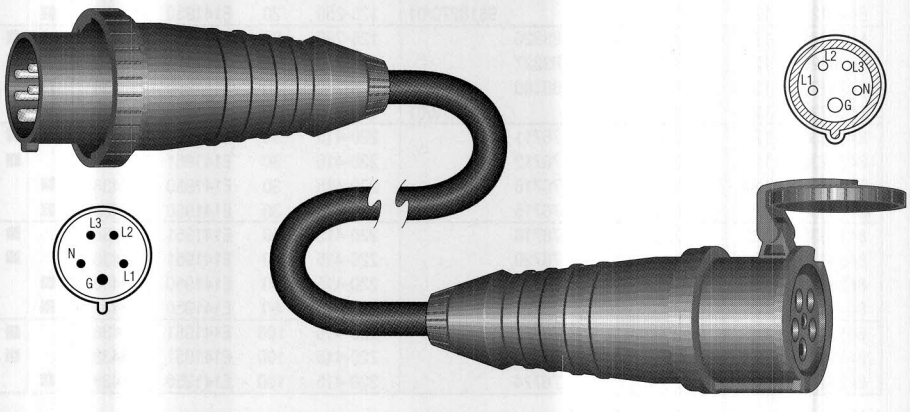
International Assemblies–125A, 5 pin (Three-Phase)

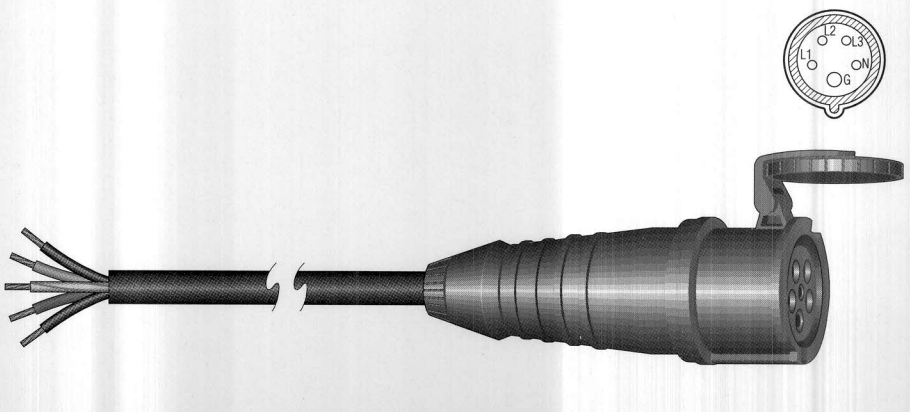
The assemblies below utilize international harmonized cordage; if you require a UL/CSA assembly with AWG cordage, please contact us.

Standard Cordset Assembly

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87550010	125A 400VAC three-phase	Red	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Plug Part Number	Cordage Size & Type	Connector Part Number
84154351	5x35.0mm² (rubber)	84354350

Standard Cord Assemblies

Assembly Part Number	Rating	Housing Color Code	Overall Length	Illustration
87550020	125A 400VAC three-phase	Red	(≈2.5m)	

COMPONENT SPECIFICATIONS		
Jacket & Conductor Strip	Cordage Size & Type	Connector Part Number
50mm/10mm	5x35.0mm² (rubber)	84354350

Approval File Numbers and Torque Requirements for High Power Connectors

IEC 60309* CONNECTORS		APPROVALS & RATINGS International				North America						SCREW TORQUE Wire Size		Terminal	Strain
Part Number	See Page	Volt. Rat. (V~)	Amp. Rat.	VDE File No.	SEMKO File No.	Volt. Rat. (VAC)	Amp. Rat.	UL File No.	CSA File No.	Panel Mount	Cable Mount	Int'l. Metric†	N.A. AWG††	Nm.	Nm.
84131211	120	230	16	76713		125-250	20	E141951	89438		■	1.5mm²	14AWG	0.8	0.5
84331211	120	230	16	76714		125-250	20	E141951	89438		■	1.5mm²	14AWG	0.8	0.5
84231201	120	230	16	76717		125-250	20	E141950	89438	■		1.5mm²	14AWG	0.8	
84431241	120	230	16		9818270/01	125-250	20	E141950	89438	■		1.5mm²	14AWG	0.8	
84132201	122	230	32	83226		125-250	30	E141951	89438		■	4mm²	8AWG	1.2	1.2
84332201	122	230	32	83227		125-250	30	E141951	89438		■	4mm²	8AWG	1.2	1.2
84232201	122	230	32	86180		125-250	30	E141950	89438	■		4mm²	8AWG	1.2	
84432241	122	230	32		9818272/01	125-250	30	E141950	89438	■		4mm²	8AWG	1.2	
84152301	124	400	32	76711		220-415	30	E141951	89438		■	4mm²	8AWG	1.2	1.2
84352301	124	400	32	76712		220-415	30	E141951	89438		■	4mm²	8AWG	1.2	1.2
84252301	124	400	32	76716		220-415	30	E141950	89438	■		4mm²	8AWG	1.2	
84452301	124	400	32	76715		220-415	30	E141950	89438	■		4mm²	8AWG	1.2	
84153351	126	400	63	76718		220-415	60	E141951	89438		■	10mm²	4AWG	2.0	2.0
84353351	126	400	63	76720		220-415	60	E141951	89438		■	10mm²	4AWG	2.0	2.0
84253361	126	400	63	76723		220-415	60	E141950	89438	■		10mm²	4AWG	2.0	
84453351	126	400	63	76721		220-415	60	E141950	89438	■		10mm²	4AWG	2.0	
84154351	128	400	125	76722		220-415	100	E141951	89438		■	35mm²	2AWG	10.0	2.0
84354350	128	400	125	76719		220-415	100	E141951	89438		■	35mm²	2AWG	10.0	2.0
84254371	128	400	125	76724		220-415	100	E141950	89438	■		35mm²	2AWG	10.0	

† Minimum wire size per IEC 60309*

†† Wire size indicated is suitable for continuous use at 100% of rating. Smaller wire sizes may be used in accordance with National Electirc Code. Refer to NEC to determine wire size. Cord Connectors and Plugs are approved for use with oil-resistant, non-oil resistant extra hard service, and hard service cords.

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60309 is the same as the older designation IEC 309. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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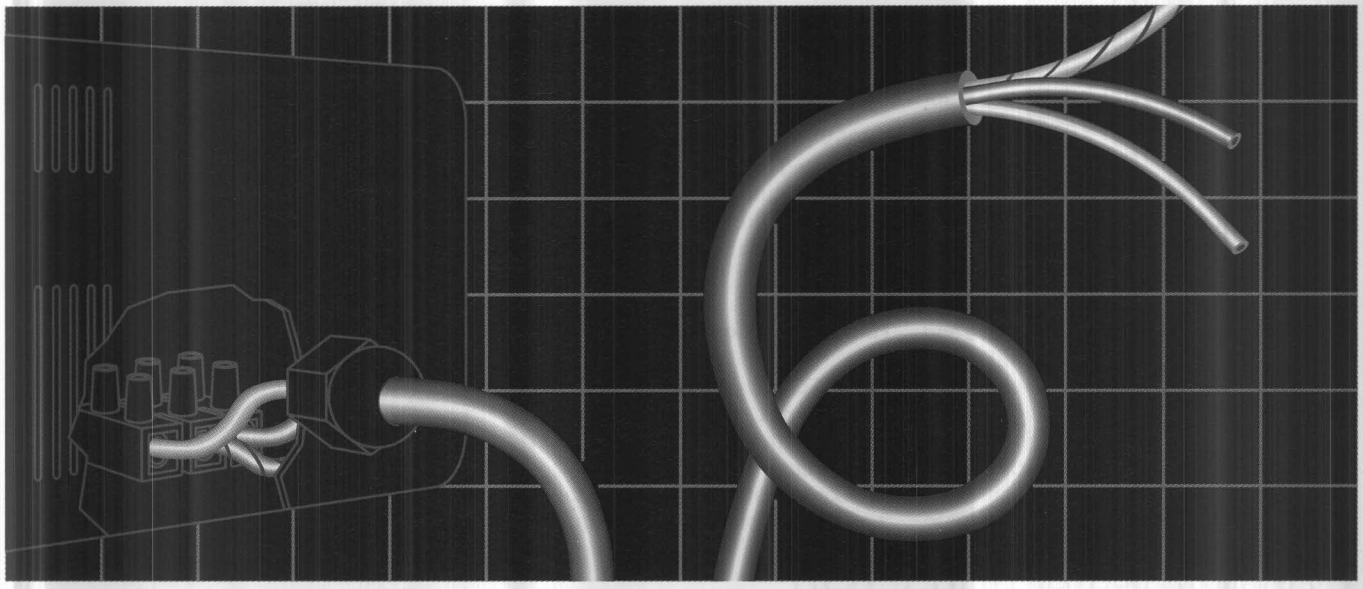
International & North American Cordage



When Do I Need Cordage?

Specify cordage when:

- A molded-on plug is not available or you wish to assemble the plug onto the cordage just prior to shipment.
- The product draws more than 3.0-3.5 KVA which is generally beyond the limits of most commonly used single-phase, molded-on power plug/socket systems.

North American & International Cordage Standards

The principal North American cordage specifications are UL 62 and CSA C22.2, No. 49. In Europe, the most important documents are CENELEC publications HD-21 ("Harmonization Document" 21 covering PVC insulated flexible cordage) which is similar to IEC 60227*, and HD-22 (the CENELEC document for rubber insulated cordage). Australian and New Zealand requirements resemble the standards outlined in IEC 60227*.

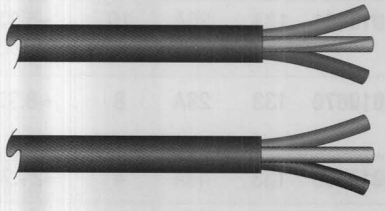
The CENELEC harmonization documents, published in the early 1970s, standardized European cordage requirements. Each of the European countries signing HD-21 and 22 has agreed to recognize the cordage testing and evaluation that is performed by any of the other signatories to the treaty. Therefore, HD-21 and 22 cordage will carry one agency test mark. (North American and harmonized cordage types are described in more detail in the following section.)

North American & International Harmonized Cordage Types Compared

Note: Because of the differences in European and North American cordage standards and construction, be sure to specify harmonized cordage for equipment designed for use in Europe and North American cordage for equipment designed for use in the United States or Canada.

The constructional requirements of international harmonized cordage are significantly different from UL/CSA constructions of approximately the same size. First, the tensile strength of cordage tested and recognized under UL 62 is typically greater than similar sizes of harmonized cordage. The additional tensile strength is usually achieved on U.S. cordage through the use of jute fillers which normally lay between the individual insulated conductors. Although harmonized constructions occasionally include one or more textile threads in construction, these are used only as markers to indicate the manufacturer of the cordage.

Another difference is the color coding of conductors. Note that UL allows international color coding on AWG type cordage.



Conductors	North America	International
Line	Black	Brown
Neutral	White	Light Blue
Ground	Green	Green/Yellow

The two types also differ in wire sizes and stranding. North American cordage is sized in accordance with the American Wire Gauge (AWG) system; harmonized cordage is sized in terms of the cross sectional area of the conductor expressed in square millimeters (mm^2).

To compare the North American AWG cordage to the harmonized types, refer to the Cordage Selection Chart (page 132).

Designing for export?

Designing for export with the customer in mind alleviates the need for the customer to use adapters or rewire the product for proper power supply connections. We make it easy to design for export with international and North American 3-wire and 5-wire cordage from Panel Components Corporation. Panel Components Corporation offers cordage in a wide range of sizes and types including PVC, rubber, fillerless, and shielded cordage. Commonly specified harmonized and North American 3- and 5-wire power cordage are available from stock with no minimum order quantities.

IEC publication 60309* defines a family of plugs, socket-outlets, cordage couplers, and appliance couplers that can be used on equipment going to both domestic and international markets. It is no longer

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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molded plugs and connectors will allow you to connect and test your equipment before exporting. There are currently twelve common (3-wire) plug and socket standards used worldwide. Equip your product with the correct plug, connector, and cordage for the country to

CENELEC HD-21 and HD-22 provide for three types of cordage marking to identify the agency approval and manufacturer:

1. Cordage may be jacket-embossed; or
2. The primary insulation of one

Made-to-Order Assembly Services

We offer in-house cordage assembly services with no minimum order and quick turnaround times–see pages 75-86 for examples.

Cordage Selection Chart

Specify the correct harmonized cordage for your export products based on the cordage that you would use for your product in North America. Your product will draw less current at 220/240 volts overseas than it does here at 120 volts.

To use the chart, follow these steps:

1. Begin with the amperage rating of your product at 120 VAC (single/three phase).
2. Determine the abrasion resistance (PVC or rubber jacket) that you require.
3. In the Cordage Selection Chart, find the North American cordage that is rated adequately for your product. The appropriate international equivalent may be found on the same line of the chart just to the right.
4. Order custom lengths by the foot or meter.

Note: Because of the differences in European and North American cordage standards and construction, specify AWG cordage on export products.

	Conductor Material		If this cordage meets your North American requirements at 115VAC...					then this cordage probably meets your international requirements at 230VAC.			
	PVC	Rubber	Part Number	Shown on Page	Current Rating @ 120V	AWG	Conductor Size compare to mm²	Part Number	See Page	Current Rating @ 220/240V	Conductor Size mm²
Single-phase (3-wire)	■		**86010450**	133	10A	18	≈.82	**86020020**	135	6A	.75
	■		**86010460**	133	13A	16	≈1.33	**86020030**	135	10A	1.00
	■		**86010470**	133	18A	14	≈2.09	**86020030**	135	10A	1.00
		■	**86010600**	133	18A	14	≈2.09	**86020300**	135	16A	1.50
	■		**86010480**	133	25A	12	≈3.32	**86020040**	135	16A	1.50
		■	**86010610**	133	25A	12	≈3.32	**86020300**	135	16A	1.50
		■	**86010620**	133	30A	10	≈5.37	**86020310**	135	25A	2.50
		■	**86010630**	133	40A	8	≈8.37	**86020320**	135	32A	4.00
Three-phase (5-wire)	■	■	**86010661**	133	20A	10	≈5.37	**86020410** **86020210**	135 135	26A 20A	2.50 2.50
	■	■	**86010670**	133	28A	8	≈8.37	**86020410** **86020210**	135 135	26A 20A	2.50 2.50
		■	**86010690**	133	48A	4	≈21.29	**86020430**	135	44A	6.00
		■	**86010700**	133	64A	2	≈33.62	**86020440**	135	61A	10.0

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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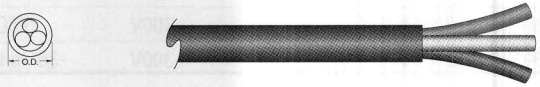
Fax toll-free: (800) 645-5360

86010681	3 x 18 AWG	10A	300V	60°C	Black	41/34 gauge	1627	6.60	SVT
86010460	3 x 16 AWG	13A	300V	60°C	Black	26/30 gauge	2600	8.76	SJT
86010470	3 x 14 AWG	18A	300V	60°C	Black	41/30 gauge	4100	9.60	SJT
86010480	3 x 12 AWG	25A	300V	60°C	Black	65/30 gauge	6500	11.30	SJT

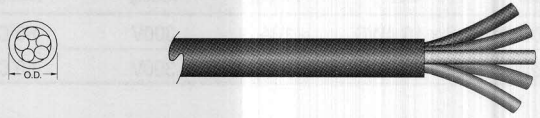
3-Wire Rubber Jacket



UL listed, CSA certified
Color coding of conductors: black=line • white=neutral • green=ground

Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86010600	3 x 14 AWG	18A	600V	-35°C to 90°C	Black	41/30 gauge	4100	13.72	SO/SOW
86010610	3 x 12 AWG	25A	600V	-35°C to 90°C	Black	65/30 gauge	6500	15.49	SO/SOW
86010620	3 x 10 AWG	30A	600V	-35°C to 90°C	Black	105/30 gauge	10,500	17.02	SO/SOW
86010630	3 x 8 AWG	40A	600V	-35°C to 90°C	Black	65/26 gauge	16,500	19.81	SO/SOW

5-Wire Rubber Jacket



UL listed, CSA certified
Color coding of conductors: black, red, orange=line • white=neutral • green=ground

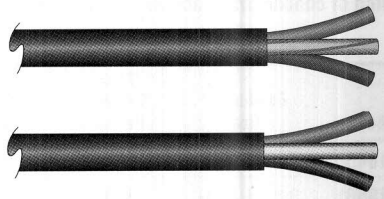
Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86010661	5 x 10 AWG	20A	600V	-35°C to 90°C	Black	104/30	10,530	20.07	SO/SOW
86010670	5 x 8 AWG	28A	600V	-40°C to 90°C	Black	65/26	16,514	26.67	SO/SOW
86010690	5 x 4 AWG	48A	600V	-35°C to 90°C	Black	420/.24	42,000	36.32	SEO
86010700	5 x 2 AWG	64A	600V	-35°C to 90°C	Black	133/23	66,360	36.07	SO/SOW

North American Fillerless Cordage

Metric Conversion Table
See page 264.

The North American cordage below is fillerless and available with North American or international color coding on the conductors. The advantage of fillerless cordage is that jute or paper fillers are replaced by a single Kevlar™ filament in the ground conductor to provide the required tensile strength of the cordage. This eliminates the need to remove the filler when the cordage is terminated, saving time and eliminating the possibility of assembler injury. Note that fillerless cordage is smaller in diameter than conventional cordage with similar ratings. Fillerless Cordage is available from stock in white, black, gray, tan, yellow, and orange. Call (800) 662-2290 for other colors available by special order.

North American 3-Wire Thermoplastic (PVC) Jacket



UL listed, CSA certified

Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86030100	3 x 18 AWG	10A	300V	60°C	Black	16/30 gauge	1600	7.82	SJT*
86030130	3 x 18 AWG	10A	300V	105°C	Black	41/34 gauge	1608	6.22	SVT*
86030140	3 x 18 AWG	10A	300V	-35° to 60°C	Gray	16/30 gauge	1600	7.82	SJT**
86030160	3 x 18 AWG	10A	300V	-35° to 60°C	Black	16/30 gauge	1600	7.82	SJT†
86030190	3 x 18 AWG	10A	300V	-35° to 60°C	Black	41/34 gauge	1608	6.22	SVT†
86030110	3 x 16 AWG	13A	300V	-35° to 60°C	Black	26/30 gauge	2613	8.51	SJT *
86030170	3 x 16 AWG	13A	300V	-35° to 60°C	Black	26/30 gauge	2613	8.51	SJT†
86030120	3 x 14 AWG	18A	300V	60°C	Black	41/30 gauge	4121	9.40	SJT*
86030180	3 x 14 AWG	18A	300V	-35° to 60°C	Black	41/30 gauge	4121	9.40	SJT†

* Cordage utilizes North American color coding of conductors: black=line • white=neutral • green=ground

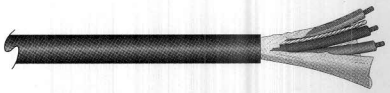
† Cordage utilizes international color coding of conductors: brown=line • blue=neutral • green/yellow=ground; Note: cordage above is not harmonized.

**Cordage utilizes color coding of conductors: black=line • white=neutral • green/yellow=ground

North American and International Shielded Cordage

The North American and international shielded cordage below is PVC jacketed and available in black with international color coding. The North American shielded cordage utilizes PVC insulation, paper filler, and an aluminum foil shield with a 20/7 x 28TC drain wire and tissue paper separator. The international shielded cordage utilizes aluminum braided wire.

North American 3-Wire Shielded Cordage



UL listed, CSA certified
Color coding of conductors: brown=line • blue=neutral • green/yellow=ground

Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86024000	3 x 18 AWG	10A	300V	60°C	Black	16/30 gauge	1600	8.26	SJT
86024010	3 x 16 AWG	13A	300V	60°C	Black	26/30 gauge	2600	8.76	SJT

International 3-Wire Shielded Cordage

Color coding of conductors: brown=line • blue=neutral • green/yellow=ground

Part Number	Conductor Size	Max. Current Rating	Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86021030	3 x 1.0mm^2	10A	300/500V	-40° to 70°C	Black	32/0.2mm	1984	6.3-8.0	A05VVF3G1.00††

††Cordage type is shielded international cordage, but is not harmonized and carries no approvals.

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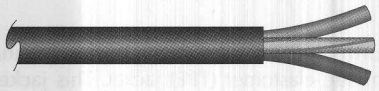
Fax toll-free: (800) 645-5360

International Harmonized Cordage

Metric Conversion Table
See page 264.

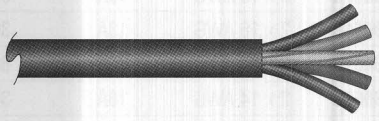
3-Wire Thermoplastic (PVC) Jacket



Approved by VDE or IMQ to HD-21.*
Color coding of conductors: brown=line • blue=neutral • green/yellow=ground

Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom) (mm)	Cordage Type
86020020	3 x 0.75mm²	6A	300/500V	-40°C to 70°C	Black	24/0.20mm	1488	6.0-7.6	H05VVF3G0.75
86020120	3 x 0.75mm²	6A	300/500V	-40°C to 70°C	Gray	24/0.20mm	1488	6.0-7.6	H05VVF3G0.75
86020030	3 x 1.00mm²	10A	300/500V	-40°C to 70°C	Black	32/0.20mm	1984	6.3-8.0	H05VVF3G1.00
86020130	3 x 1.00mm²	10A	300/500V	-40°C to 70°C	Gray	32/0.20mm	1984	6.3-8.0	H05VVF3G1.00
86020040	3 x 1.50mm²	16A	300/500V	-40°C to 70°C	Black	30/0.25mm	2906	7.4-9.4	H05VVF3G1.50
86020140	3 x 1.50mm²	16A	300/500V	-40°C to 70°C	Gray	30/0.25mm	2906	7.4-9.4	H05VVF3G1.50
86020050	3 x 2.50mm²	25A	300/500V	-40°C to 70°C	Black	50/0.25mm	4844	9.2-11.4	H05VVF3G2.50

5-Wire Thermoplastic (PVC) Jacket



Approved by VDE or IMQ to HD-21.*
Color coding of conductors: black, black, brown=line • blue=neutral • green/yellow=ground

Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86020200	5 x 1.5mm²	16A	300/500V	-40°C to 70°C	Black	30/0.25mm	2906	9.5-11.6	H05VVF5G1.50
86020210	5 x 2.5mm²	20A	300/500V	-40°C to 70°C	Black	50/0.25mm	4844	11.2-13.9	H05VVF5G2.50

3-Wire Rubber Jacket

Approved by VDE or IMQ to HD-22.*
Color coding of conductors: brown=line • blue=neutral • green/yellow=ground

Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86020300	3 x 1.5mm²	16A	450/750V	-30°C to 60°C	Black	30/0.25mm	2906	9.2-11.9	H07RNF3G1.50
86020310	3 x 2.5mm²	25A	450/750V	-30°C to 60°C	Black	50/0.25mm	4844	10.9-14.0	H07RNF3G2.50
86020320	3 x 4.0mm²	32A	450/750V	-30°C to 60°C	Black	56/ 0.30mm	7812	12.7-16.2	H07RNF3G4.00

5-Wire Rubber Jacket

Approved by VDE or IMQ to HD-22.**
Color coding of conductors: black, black, brown=line • blue=neutral • green/yellow=ground

Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86020410	5 x 2.5mm²	26A	450/750V	-30°C to 60°C	Black	50/0.25mm	4844	13.3-17.0	H07RNF5G2.50
86020420	5 x 4.0mm²	34A	450/750V	-30°C to 60°C	Black	56/0.30mm	7812	16.0-19.5	H07RNF5G4.00
86020430	5 x 6.0mm²	44A	450/750V	-30°C to 60°C	Black	84/0.30mm	11,718	18.0-24.5	H07RNF5G6.00
86020440	5 x 10.0mm²	61A	450/750V	-30°C to 60°C	Black	80/0.40mm	19,091	24.0-30.5	H07RNF5G10.0
86010490	5 x 16.0mm²	82A	450/750V	-30°C to 60°C	Black	128/0.40mm	31,240	26.4-33.3	H07RNF5G16.0
86020500	5 x 35.0mm²	135A	450/750V	-30°C to 60°C	Black	280/0.40mm	—	36.8-45.8	H07RNF5G35.0

*According to HD-21 and HD-22, HAR or standard agency marks must be displayed on outer jacket or conductor jacket. Due to customer requests, Interpower Component's cordage, whenever possible, will have <HAR> marks on the outer jacket.

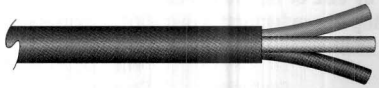
**According to HD-21 and HD-22, HAR or standard agency marks must be displayed on outer jacket or conductor jacket. Due to customer requests, Interpower Component's cordage, whenever possible, will have <HAR> marks on the outer jacket. Current rating for industrial use per DIN VDE 0298-4: 1495-04. Application determines current rating of flexible cordage.

Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86030520	3 x 16 AWG	13A	600V	105˚C	Black	26/30 gauge	2600	10.41	SEOW†
86030610	2 x 16 AWG	13A	300V	-50˚0 to 105˚C	Black	26/30 gauge	2580	8.00	SJEOW††
86030510	3 x 14 AWG	18A	600V	-50˚C to 105˚C	Black	41/30 gauge	4110	13.72	SEOW†
86030620	2 x 14 AWG	18A	300V	-50˚C to 105˚C	Black	41/30 gauge	4110	9.14	SJEOW††
86030500	3 x 12 AWG	25A	600V	-50˚C to 105˚C	Black	65/30 gauge	6530	16.13	SEOW†

† Cordage Type: SEOW (UL), STOW (CSA)
†† Cordage Type: SJEOW (UL), SJTO (CSA)

NEW! Oil Resistant North American Cordage

3-Wire PVC Jacket



UL listed, CSA certified
Color coding of conductors: black=line • white=neutral • green=ground

Part Number	Conductor Size	Max. Current Rating	Max. Voltage Rating	Temp. Rating	Jacket Color	Approx. Stranding	≈ Circular Mil Area	Approx. O.D. (nom.) (mm)	Cordage Type
86030700	3 x 12 AWG	25A	600V	105˚C	Black	65/30 gauge	6500	16.13	STO*
86030710	3 x 14 AWG	18A	600V	105˚C	Black	41/30 gauge	4100	13.72	STO*

* Cordage Type: STO (UL), ST (CSA)

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Stripping

Panel Components Corporation uses stripping equipment that makes it easy to strip all of the cordages listed in this brochure. The maximum strip length is 45.72 cm. We can also cut and strip conductors to specified lengths and apply crimp terminations which one can specify from a wide variety that we maintain in stock. Standard stock terminations include: barrel crimps, ring terminals, spade terminals, straight-style disconnects, flag-style quick disconnects, and ferrules. Our cordage stripping and crimp termination services are particularly attractive with large rubber jacketed cordage that is difficult to strip and handle. Call for more information at the numbers below.

and installation of flag and wrap-around labels (see chart on the next page). We are also set up to offer special carton marking and labeling. And, we can add the CE Mark to power cordage assemblies used on equipment marketed in Europe.

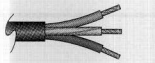
Our skilled assemblers work in a well-equipped, comfortable manufacturing facility that is ISO 9002 Certified. Continuous training enables our assemblers to perform a wide variety of the work that moves through our shop. This assures a quick turn around time and cordage assemblies that will meet your specifications. Assuming that appropriate materials are specified, our power cordage assemblies can be

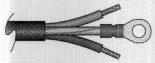
Panel Components Corporation are tested at 2500 VAC to verify the integrity of the insulation systems. The resistance of the ground line is tested at 25A to assure its integrity. Continuity tests verify that the cordage has been wired correctly. Please note that these are not sample tests. At Panel Components Corporation, 100% of all power cord assemblies are fully tested before a test mark is applied.

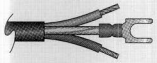
Finally, Panel Components Corporation maintains lot code traceability on all components used in manufacturing power cordage assemblies. This allows **our** customers to meet the highest demands for quality and traceability placed on them by **their** customers.

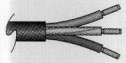
Made-to-Order Cordage Terminations

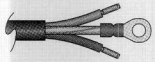
A sample of possible configurations

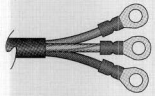

3 bare wires, stripped to your specs

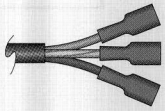

2 bare wires, 1 ring terminal

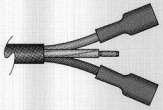

2 bare wires, 1 spade terminal

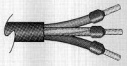

3 wires, fitted with barrel crimps


2 barrel crimps, 1 ring terminal

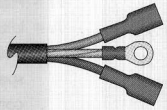

3 wires, fitted with ring terminals

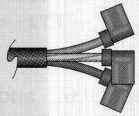

3 wires, fitted with straight-style quick disconnects

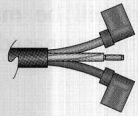

1 barrel crimp, 2 straight-style quick disconnects

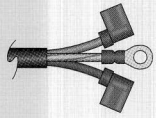

3 wires, fitted with crimped ferrules

NOTE: All configurations shown available with North American or internationally color coded cordage. UL/CSA assembly services available.


1 ring terminal, 2 straight-style quick disconnects


3 wires fitted with flag-style quick disconnects


2 flag-style quick disconnects, 1 barrel crimp


2 flag-style quick disconnects, 1 ring terminal

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

North American Cable Types

Rubber	Extra Hard Service	Hard Service
SP-1		
SPE-1		
SPE-2		
SP-2		
SP-3		
SPE-3		
SV		
SVE		
SVEO		
SVO		
SVOO		
SJ		X
SJE		X
SJO		X
SJEO		X
SJEOO		X
SJOO		X
S	X	
SE	X	
SO	X	
SEO	X	
SEOO	X	
SOO	X	
SJEW		X
SJOW		X
SJEOW		X
SJEOOW		X
SJOOW		X
SEW	X	
SOW	X	
SEOW	X	
SEOOW	X	
SOOW	X	
HSJ		X
HSJO		X
HS	X	
HSO	X	
HPN		

Rubber	Extra Hard Service	Hard Service
SPT-1		
SPT1W		
SPT-2		
SPT-2W		
SPT-3		
SVT		
SVTO		
SVTOO		
SJT		X
SJTO		X
SJTOO		X
ST	X	
STO	X	
STOO	X	
SJTW		X
SJTOW		X
SJTOOW		X
STW	X	
STOW	X	
STOOW	X	

Nomenclature Key

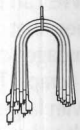
S = Service grade (also means extra hard service when not followed by J, V, or P)
J = Hard service
V = Vacuum cleaner cord - also light duty cordage
P = Parallel cordage (also known as zip cord) — Always light duty
E = Thermoplastic elastomer
O = Oil resistant
T = Thermoplastic
W = Water resistant
H = Heater cordage
A = Ultra-violet stabilized for outdoor use — normally specified on water resistant cordage
VW-1 = Flame retartdant
FT2 = Flame retartdant

As a result of harmonizing UL62 and CSA C22.2 No. 49 flexible power cord standards, effective July 2, 1998, all "outdoor use" flexible cord will be marked "W". The "A" marking is in the process of being phased out of the system and will no longer be used.

Cordage Marking & Packaging Services

Special delivery? No problem. We offer the following cordage marking and packaging services. Special carton marking or labeling is also available. Call our Customer Service Department at (800) 662-2290 for a quotation on these services.

Hank



Cords bundled:
Standard — 25 to a bundle

Coil

Cordage individually bagged and labeled

Hot stamping on cord : 12 characters

Label wrapped around cord:
Label size: 25.4mm x 50.8mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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Cordage Accessories

Suggestions for Selecting Ferrules

Selection of the correct ferrule for your application is a simple five-step process.

The **first step** in selecting a ferrule is to select the style that is appropriate for your application and specifically whether the ferrule is to be insulated or uninsulated. Insulated ferrules are slightly more expensive; however, insulated ferrules "capture" strands that don't get correctly inserted into the barrel, thereby reducing the possibility of a short between connections. Insulation also offers the opportunity to color code the connection.

The **second step** in selecting a ferrule is to identify the conductor size. The chart on page 265 provides you with data that will simplify the conversion from metric wire sizes to AWG (American Wire Gauge) sizes.

The **third step** in selecting a ferrule is to determine how long the barrel should be. Three lengths are available: normal, medium, and long barrels. The actual barrel length varies depending on the wire size capacity of the ferrule. Most applications require the normal length; however, ferrules with longer barrels are available in most sizes.

The **fourth step** in selecting a ferrule is to select the ferrule color coding system you want to use. There are three different ferrule color coding systems available. Our stock color for the ferrule insulator is based on the DIN* system. (Note: uninsulated ferrules are not color coded). Other color schemes are available by special order with a minimum quantity of 1,000 pieces and a lead time of four to six weeks.

The **fifth step** in selecting a ferrule is to determine if the application requires a double wire ferrule. Double wire ferrules are available only in insulated versions and are designed to accept only two wires. If you are using two AWG wires of the same size in a ferrule, you can determine the correct ferrule size by increasing the total wire size by three steps. For example, two 20 AWG wires are equivalent to a single 17 AWG Therefore, you would specify a 1.5mm² capacity ferrule. In theory, two 20 AWG wires might fit into a 1.0mm² capacity ferrule, however they are likely to be a tight fit.

If you are using two metric wires, two 0.75mm² wires will fit comfortably into a 2x0.75mm² ferrule (See page 143).

The ferrules are made of tin plated copper, and the insulation is a polyamide. The temperature rating is 110°C.

Although ferrules are commonly used in Europe, they are not well known in North America. Part of the reason is that much of the equipment production in Europe centers around machinery. Interconnections in machinery are usually based on terminal blocks and other connections that make screw connections desirable. In North America (where electronic equipment production focuses on computers, telecommunications, and medical equipment) interconnections are typically very small, and terminal blocks are inappropriate in many cases.

These devices are usually approved in Europe as part of the equipment. They do not have separate approvals. In North America, UL and CSA do not know how to treat these components, so for now, they are also subject to evaluation at the time the equipment is evaluated for listing.

All styles of ferrules from Panel Components Corporation come in packages of 100.

* DIN stands for Deutsches Institut fur Normung: Color coding arranged according to DIN 46228 Teil 4.

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Unsecure Connections:

Figure 2

If the wire is stranded, the individual strands will tend to move out of the way of the screw as it is tightened (figure 2).

If the wire is just slightly smaller than the opening in the contact, the screw will usually clamp several of the strands securely while the others move up along-side the screw. However, if the wire normally fills two-thirds or less of the opening in the contact, the screw may bottom out with none of the strands securely gripped. At this point, an electrically acceptable connection may exist, at least long enough for the device to be tested and shipped to the customer. However, the slightest vibration may allow the screw to back out enough that the impedance of the connection increases so that excess heat is generated. The connection could become intermittent.

Figure 3

Some contacts are designed to address this issue by including a contact tang (figure 3). This type of contact will normally assure that all strands are captured and are in contact with the screw connection.

Figure 4

If the contact does not offer a contact tang, a crimp ferrule is the best way of assuring a solid contact (figures 4 and 5).

The ferrule should be sized properly so that it slides onto the wire easily. However, the wire should fill at least 80% of the ferrule.

The ferrule is then crimped and inserted into the contact and the screw tightened. An insulated ferrule minimizes the chance that a loose strand can cause a short circuit.

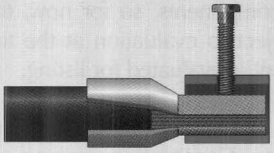
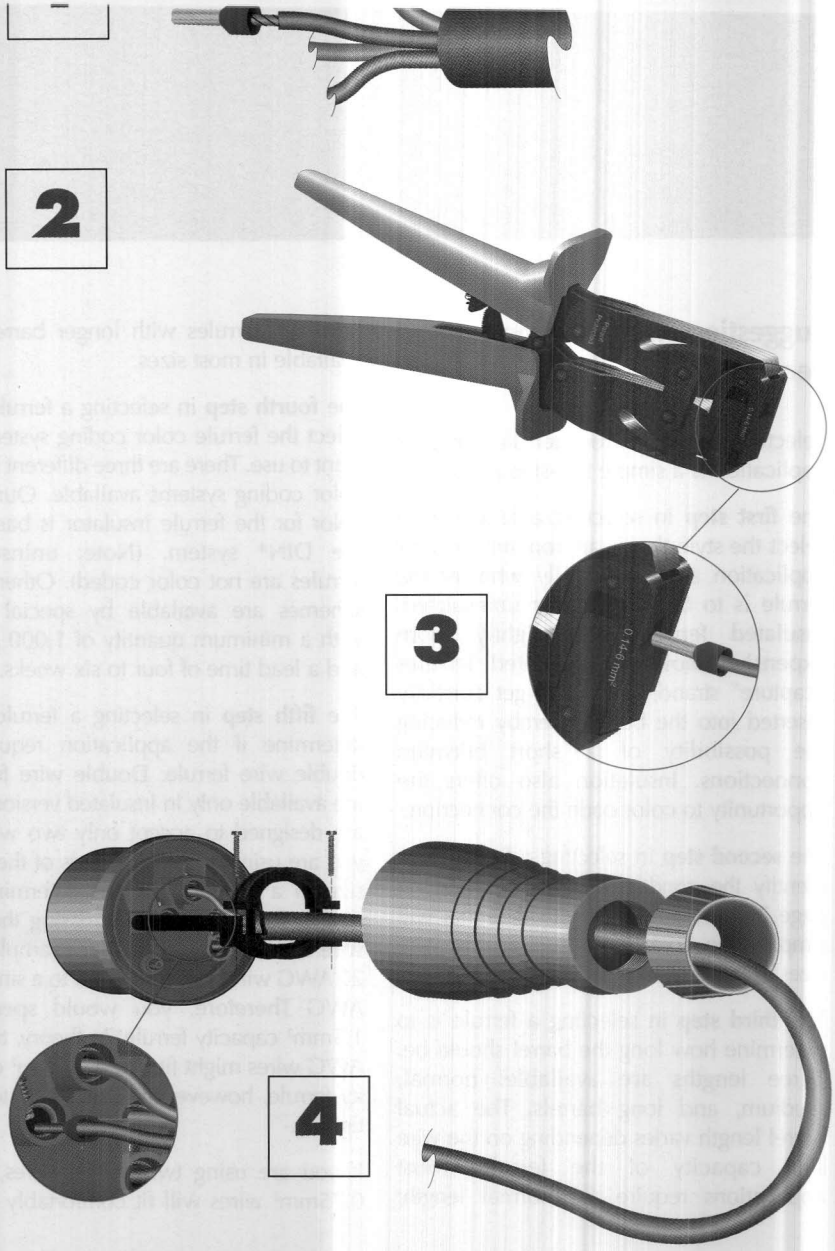


Figure 5



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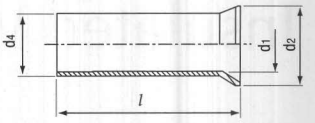
Uninsulated Wire Ferrules

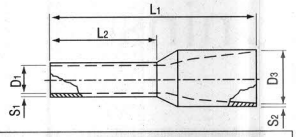


Style	Part Number	Cable mm²	Length mm	DIN* Color	Insulated	d_1	d_2	d_4	l
	82031010	0.5	—	none	no	1.0	2.1	1.3	8.0
	82031040	0.75	—	none	no	1.2	2.3	1.5	10.0
	82031070	1.0	—	none	no	1.4	2.5	1.7	8.0
	82031080	1.0	—	none	no	1.4	2.5	1.7	12.0
	82031110	1.5	—	none	no	1.7	2.8	2.0	10.0
	82031120	1.5	—	none	no	1.7	2.8	2.0	15.0
	82031150	2.5	—	none	no	2.2	3.4	2.5	8.0
	82031160	2.5	—	none	no	2.2	3.4	2.5	12.0
	82031190	4.0	—	none	no	2.8	4.0	3.2	12.0
	82031200	4.0	—	none	no	2.8	4.0	3.2	18.0
	82031230	6.0	—	none	no	3.5	4.7	3.9	12.0
	82031240	6.0	—	none	no	3.5	4.7	3.9	18.0
	82031270	10.0	—	none	no	4.5	5.8	4.9	16.0
	82031280	10.0	—	none	no	4.5	5.8	4.9	20.0
	82031310	16.0	—	none	no	5.8	7.5	6.2	18.0
	82031320	16.0	—	none	no	5.8	7.5	6.2	25.0
	82031350	25.0	—	none	no	7.3	9.5	7.7	18.0
	82031360	25.0	—	none	no	7.3	9.5	7.7	25.0
	82031390	35.0	—	none	no	8.3	11.0	8.7	18.0
	82031400	35.0	—	none	no	8.3	11.0	8.7	25.0

Dimensions in mm

* DIN stands for Deutsches Institut fur Normung: Color coding arranged according to DIN 46228 Teil 4.

Insulated Wire Ferrules



Style	Part Number	Cable mm²	Length* mm	DIN** Color	Insulated	L_1	L_2	D_1	S_1	D_3	S_2
	82031020	0.5	N	white	yes	14.0	8.0	1.0	0.15	2.6	0.25
	82031030	0.5	M	white	yes	16.0	10.0	1.0	0.15	2.6	0.25
	82031050	0.75	N	gray	yes	14.0	8.0	1.2	0.15	2.8	0.25
	82031060	0.75	M	gray	yes	16.0	10.0	1.2	0.15	2.8	0.25
	82031090	1.0	N	red	yes	14.0	8.0	1.4	0.15	3.0	0.30
	82031100	1.0	M	red	yes	16.0	10.0	1.4	0.15	3.0	0.30
	82031130	1.5	N	black	yes	14.0	8.0	1.7	0.15	3.5	0.30
	82031140	1.5	M	black	yes	16.0	10.0	1.7	0.15	3.5	0.30
	82031170	2.5	N	blue	yes	15.0	8.0	2.2	0.15	4.2	0.30
	82031180	2.5	M	blue	yes	19.0	12.0	2.2	0.15	4.2	0.30
	82031210	4.0	N	gray	yes	17.0	10.0	2.8	0.20	4.8	0.30
	82031220	4.0	M	gray	yes	20.0	12.0	2.8	0.20	4.8	0.30
	82031250	6.0	N	yellow	yes	20.0	12.0	3.5	0.20	6.3	0.30
	82031260	6.0	L	yellow	yes	26.0	18.0	3.5	0.20	6.3	0.30
	82031290	10.0	N	red	yes	21.0	12.0	4.5	0.20	7.6	0.40
	82031300	10.0	L	red	yes	27.0	18.0	4.5	0.20	7.6	0.40
	82031330	16.0	N	blue	yes	23.0	12.0	5.8	0.20	8.8	0.40
	82031340	16.0	L	blue	yes	29.0	18.0	5.8	0.20	8.8	0.40

Dimensions in mm

* N=Normal, M=Medium, L=Long

** DIN stands for Deutsches Institut fur Normung: Color coding arranged according to DIN 46228 Teil 4.

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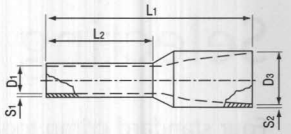
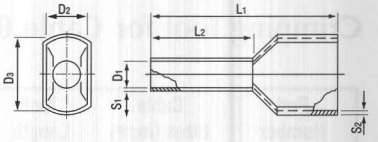
Insulated Wire Ferrules



Style	Part Number	Cable mm²	Length* mm	DIN** Color	Insulated	L_1	L_2	D_1	S_1	D_3	S_2
	82031370	25.0	N	yellow	yes	29.0	16.0	7.3	0.20	11.2	0.40
	82031380	25.0	L	yellow	yes	35.0	22.0	7.3	0.20	11.2	0.50
	82031410	35.0	N	red	yes	30.0	16.0	8.3	0.20	12.7	0.55
	82031420	35.0	L	red	yes	39.0	25.0	8.3	0.20	12.7	0.55
	82031430	50.0	N	blue	yes	36.0	20.0	10.3	0.35	15.0	0.50

Double-Wire Ferrules

Note: The ferrules below are considered "double-wire" ferrules. They are sized to accommodate two conductors in one end sleeve, which enables quick and easy potential loops.



Style	Part Number	Cable mm²	Length* mm	DIN** Color	Insulated	L_1	L_2	D_1	S_1	D_3	D_2	S_2
	82031440	2x0.5	N	white	yes	14.6	8.2	1.4	0.15	5.0	3.0	0.25
	82031450	2x0.75	N	gray	yes	14.6	8.2	1.7	0.15	5.3	2.8	0.25
	82031460	2x1.0	N	red	yes	15.8	8.2	2.05	0.15	6.3	3.4	0.25
	82031470	2x1.5	N	black	yes	15.8	8.2	2.3	0.15	6.3	3.4	0.25
	82031480	2x2.5	N	blue	yes	18.5	10.0	2.9	0.15	7.8	4.3	0.30
	82031490	2x4.0	N	gray	yes	22.0	12.0	3.6	0.20	8.8	5.0	0.30
	82031500	2x6.0	N	yellow	yes	23.0	12.0	4.6	0.20	11.2	6.2	0.50
	82031510	2x10.0	N	red	yes	24.0	12.0	5.8	0.20	13.2	7.4	0.50
	82031520	2x16.0	N	blue	yes	29.0	16.0	8.3	0.30	17.0	9.5	0.50

Dimensions in mm

* N=Normal, M=Medium, L=Long

** DIN stands for Deutsches Institut fur Normung: Color coding arranged according to DIN 46228 Teil 4.

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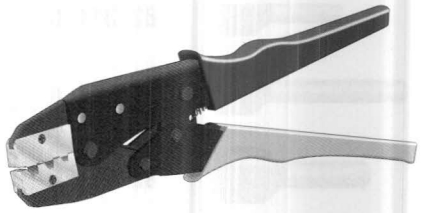
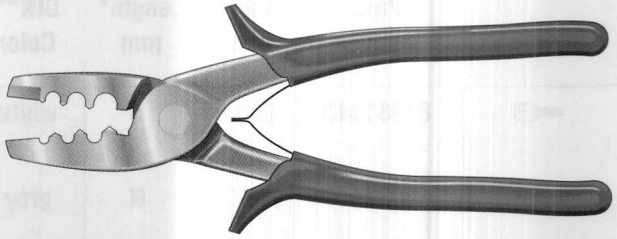
82030050 (see page 145) crimps wire in the 0.5 to 2.5mm² range, and part number **82030060** (see page 145) crimps wire in the 4.0 to 16.0mm² range.

The **82030080** (below) is a non-racheting tool that combines the ability to cut, strip, and crimp wire ranging from 0.5 to 6.0mm². It is best specified for use in lab or field applications where the convenience of cutting, stripping, and and die shown on the right is not available in this catalog. Call our Customer Service Dept. for more information about this and other crimping tools.



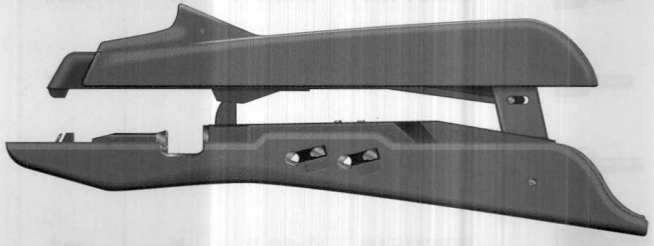
Crimping Tool for Cable 0.75–10.0mm²

Part Number	Cable Sizes (mm²)	Tool Length	Tool Weight	Illustration
82030070	0.75–10.0	180mm	0.240kg	



Crimping Tool for Cable 0.5–6.0mm²

Part Number	Cable Sizes (mm²)	Tool Length	Tool Weight	Illustration
82030080	0.5–6.0	160mm	0.120kg	



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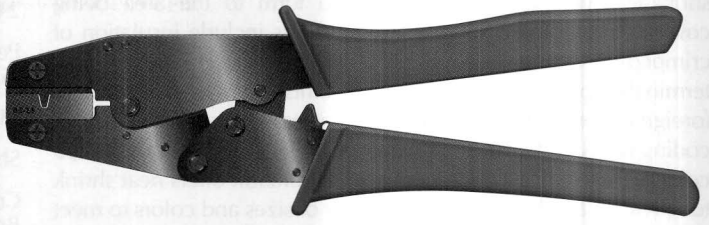
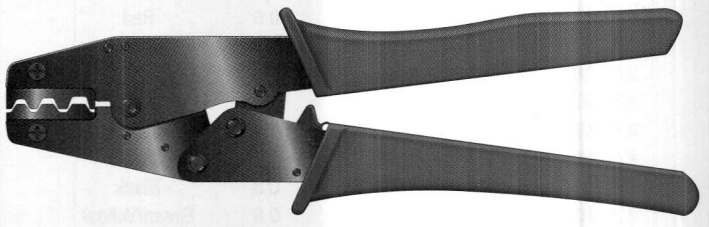
Crimping Tool for Cable 0.5–2.5mm²

Part Number	Cable Sizes (mm²)	Tool Length	Tool Weight	Illustration
82030050	0.5–2.5	225mm	0.63kg	

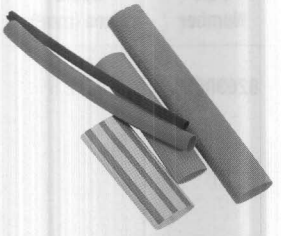
Crimping Tool for Cable 4.0–16.0mm²

Part Number	Cable Sizes (mm²)	Tool Length	Tool Weight	Illustration
82030060	4.0-16.0	225mm	0.63kg	

Heat Shrink Tubing

Heat shrink tube is made of plastic material that is designed to shrink in diameter when heated air is blown across its surface. This shrinkage will cause the material to form to the area being covered, providing a snug fit. Applications include insulation of crimped-on terminal sleeves (such as uninsulated ring or spade terminals), protection of electrical joints from dust and other foreign materials which could cause corrosion or shorts, and color coding wires for termination (where wire jackets of a nonstandard color are used). Panel Components Corporation offers heat shrink tube with a 2:1 shrink ratio in a variety of sizes and colors to meet your needs.

Specifications:



Self extinguishing according to UL 244, 105°C.

Permanent operating temperature: -55° to 125°C

Material: Cross-linked polyolefin

Shrink temperature: > 120°C

Colors: Black, Green/Yellow, White, Red, Blue, Yellow, Green, Brown, and Transparent.

Part Number	Size (mm)	Size (mm) After shrinking	Color
82040100	1.2	0.6	Black
82040200	1.2	0.6	Green/Yellow
82040300	1.2	0.6	White
82040400	1.2	0.6	Red
82040500	1.2	0.6	Blue
82040600	1.2	0.6	Yellow
82040700	1.2	0.6	Green
82040800	1.2	0.6	Transparent
82040900	1.2	0.6	Brown
82040110	1.6	0.8	Black
82040210	1.6	0.8	Green/Yellow
82040310	1.6	0.8	White
82040410	1.6	0.8	Red
82040510	1.6	0.8	Blue
82040610	1.6	0.8	Yellow
82040710	1.6	0.8	Green
82040810	1.6	0.8	Transparent
82040910	1.6	0.8	Brown
82040120	2.4	1.2	Black
82040220	2.4	1.2	Green/Yellow
82040320	2.4	1.2	White
82040420	2.4	1.2	Red
82040520	2.4	1.2	Blue
82040620	2.4	1.2	Yellow
82040720	2.4	1.2	Green
82040820	2.4	1.2	Transparent
82040920	2.4	1.2	Brown
82040130	3.2	1.6	Black
82040230	3.2	1.6	Green/Yellow
82040330	3.2	1.6	White
82040430	3.2	1.6	Red
82040530	3.2	1.6	Blue
82040630	3.2	1.6	Yellow
82040730	3.2	1.6	Green
82040830	3.2	1.6	Transparent
82040930	3.2	1.6	Brown

Part Number	Size (mm)	Size (mm) After shrinking	Color
82040140	4.8	2.4	Black
82040240	4.8	2.4	Green/Yellow
82040340	4.8	2.4	White
82040440	4.8	2.4	Red
82040540	4.8	2.4	Blue
82040640	4.8	2.4	Yellow
82040740	4.8	2.4	Green
82040840	4.8	2.4	Transparent
82040940	4.8	2.4	Brown
82040150	6.4	3.2	Black
82040250	6.4	3.2	Green/Yellow
82040350	6.4	3.2	White
82040450	6.4	3.2	Red
82040550	6.4	3.2	Blue
82040650	6.4	3.2	Yellow
82040750	6.4	3.2	Green
82040850	6.4	3.2	Transparent
82040950	6.4	3.2	Brown
82040160	9.5	4.8	Black
82040260	9.5	4.8	Green/Yellow
82040360	9.5	4.8	White
82040460	9.5	4.8	Red
82040560	9.5	4.8	Blue
82040660	9.5	4.8	Yellow
82040760	9.5	4.8	Green
82040860	9.5	4.8	Transparent
82040960	9.5	4.8	Brown
82040170	12.7	6.4	Black
82040270	12.7	6.4	Green/Yellow
82040370	12.7	6.4	White
82040470	12.7	6.4	Red
82040570	12.7	6.4	Blue
82040670	12.7	6.4	Yellow
82040770	12.7	6.4	Green
82040870	12.7	6.4	Transparent
82040970	12.7	6.4	Brown

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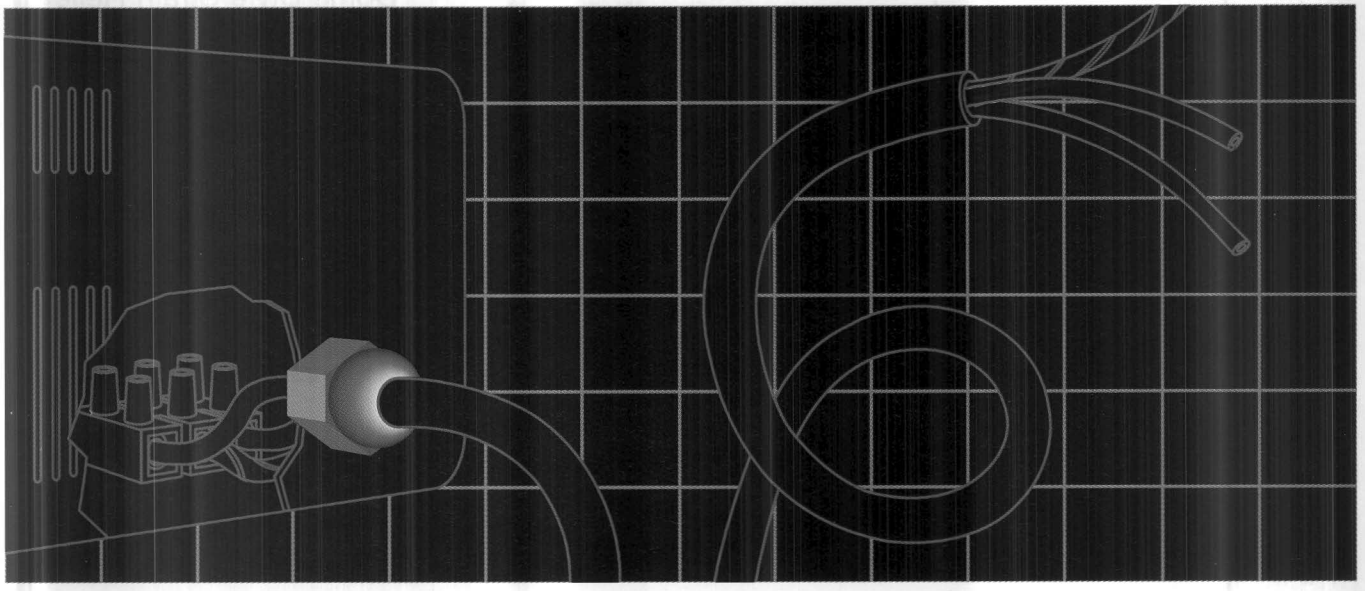
Strain Reliefs



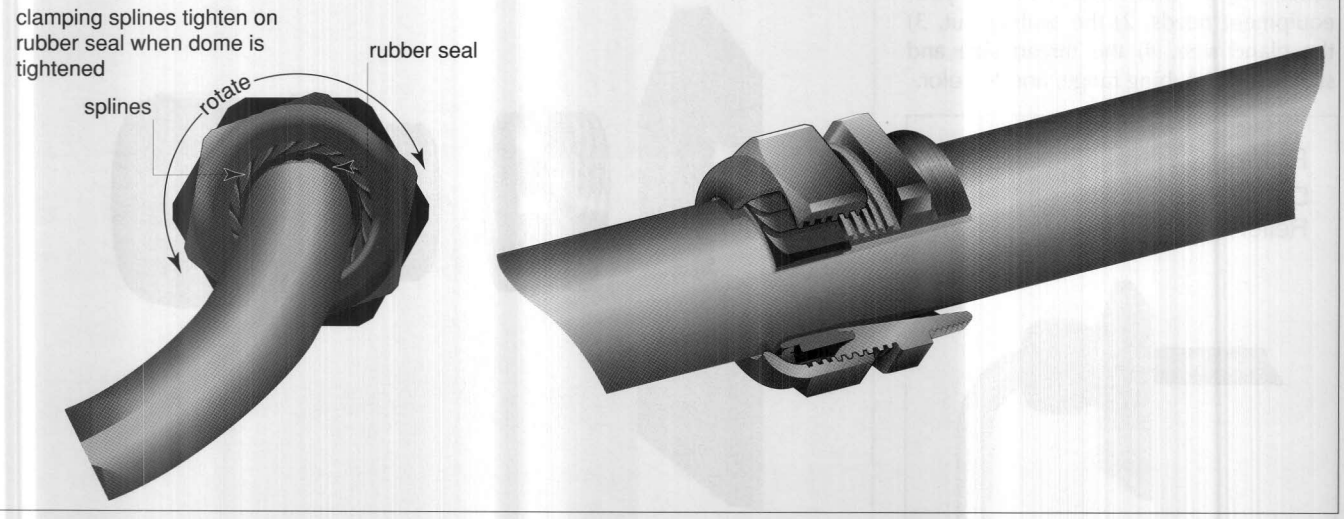
North American and international strain reliefs from Panel Components Corporation provide a liquid-tight seal on the power cord entry and at the same time, provide extra protection to your power cords (Figure 1). Strain reliefs extend cord life and reinforce the cord connection to your equipment.

The strain reliefs described in this section are intended for use in mechanically securing the power supply cord to a piece of electrical equipment in accordance with IEC 60335* and other international standards.

All styles of Interpower™ strain reliefs are threaded, and can be assembled in two different ways. The mounting threads of the strain relief can be threaded directly into the panel of your equipment, or the strain relief can be eased through a clearance hole in the panel of your equipment and fitted with a locking nut. Obviously, each of these options would require a different sized clearance hole in the equipment panel. Our specification charts and drawings for each style of Interpower strain relief found in this section should make it simple to determine the size of the hole that must be made to accommodate the strain relief.

Interpower™ strain reliefs are available in two different types of mounting threads: NPT and PG. NPT (National Pipe Thread)

Figure 1
Sealing of Strain Reliefs



*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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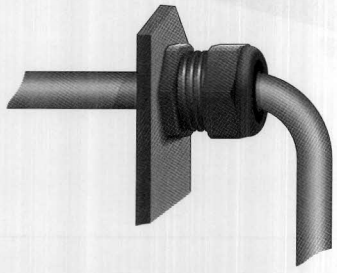
conditions.

Most of the items shown in this catalog are available with either NPT or PG threads. The thread system you choose to use will depend on where your equipment will be used. Equipment intended for use in North America should make use of NPT strain reliefs, and equipment intended for use in Europe should make use of PG strain reliefs. For convenience, Panel Components Corporation also offers a PG to NPT adapter (Figures 2 & 5) (see pages 164).

Figure 2
PG to NPT adapter

When ordering Interpower™ strain reliefs, you will need to consider the following factors: 1) Selecting the strain relief style that best meets your equipment needs, 2) the sealing nut, 3) the gland size, 4) the thread size and style, 5) wire/tubing range, and 6) color.

Figure 3
Dome Style Strain Relief in use



designed to accommodate up to eight holes. We can also help you custom design an insert to meet your design needs, but there must be at least 1mm distance between holes. The inserts are made of durable water resistant elastomer.

Flex style reliefs (see pages 151) are so named because they offer flexible bend protection to the cord entering your equipment. They are designed to eliminate the possibility of the power cord kinking at the point where the cord enters the equipment. The spiral shaped spring wraps around the cord and adds strength to the cord where it is most vulnerable to damage.

PG

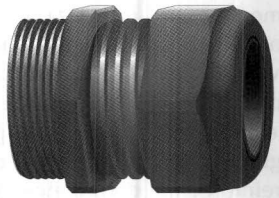


Figure 5
PG to NPT adapter in use

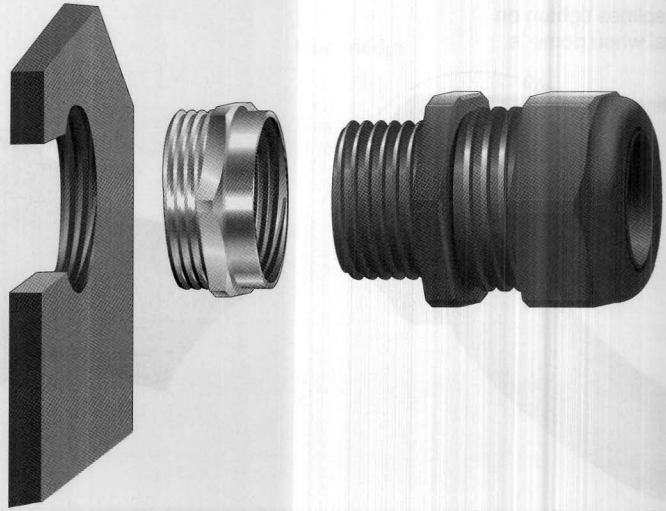


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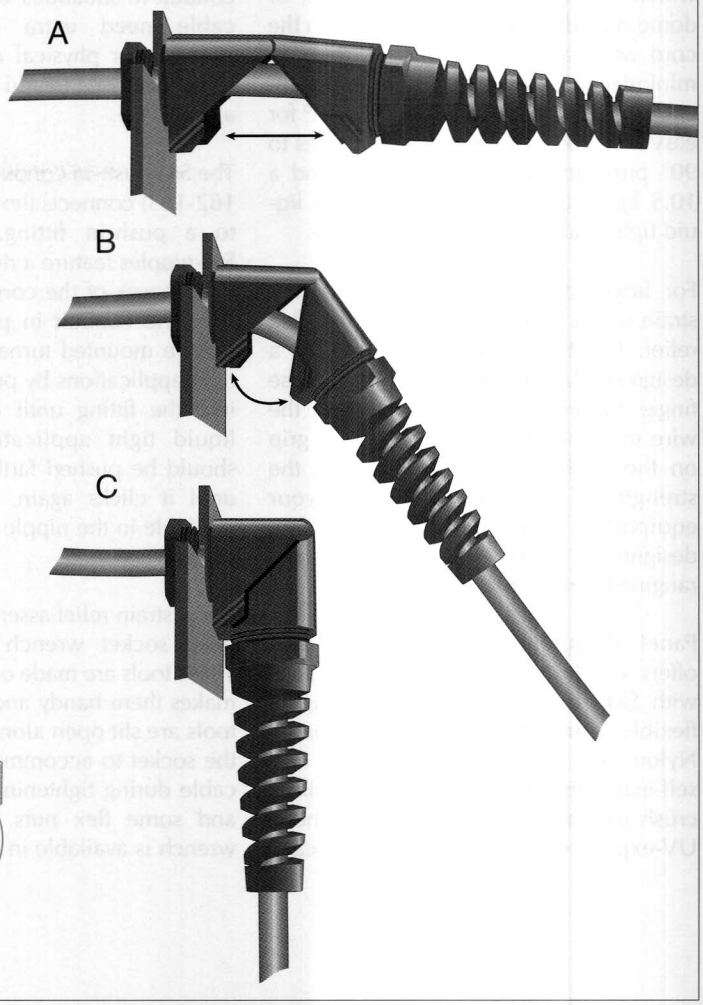
Figure 6
90° Strain Relief with Flex Relief

Our 90° strain reliefs (see pages 154-155) which can be used with both a flex or dome nut add strength and support to the cord while adding a 90° snap elbow to minimize wire strain in a bending application. The snap elbow opens to 180° for easy insertion of the wires (Figure 6A). This eliminates the possibility of the cord being damaged, which is a contrast to the damage that can result from pulling a cord through a 90° metal strain relief (Figure 6D). After the cord has been fed through, the strain relief is then closed to 90° providing additional support to the cord and a 10.5 kg/m² (kilograms/square meter) liquid tight seal (Figures 6B & 6C).



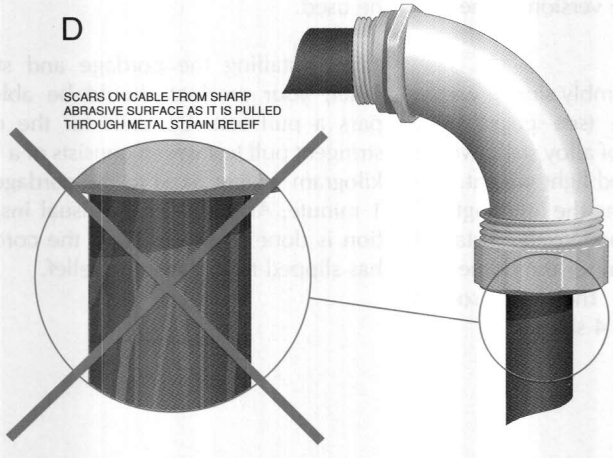
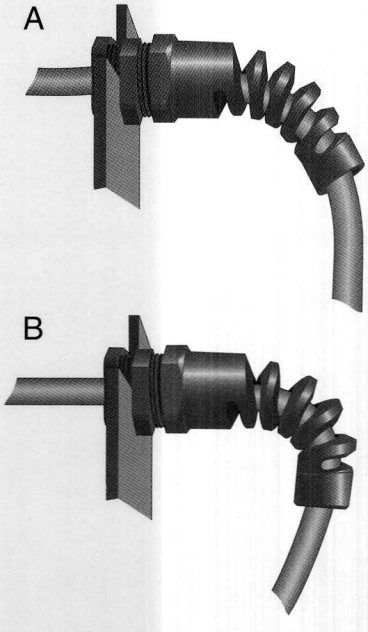


Figure 7
Flex Relief

Flex style reliefs (see page 151) are so named because they offer flexible bend protection to the cord entering your equipment (Figure 7A). They are designed to eliminate the possibility of the power cord kinking when the cord is pulled at extreme angles (Figure 7B). The spiral shaped spring wraps around the cord and adds strength to the cord where it is most vulnerable to damage.



Our 90° strain reliefs (see pages 154-155) which can be used with both a flex or dome nut add strength and support to the cord while adding a 90° snap elbow to minimize wire strain in a bending application. The snap elbow opens to 180° for easy insertion of the wires, then closes to 90° providing added strain relief and a 10.5 kg/m² (kilograms/square meter) liquid tight seal.

For larger cordage we offer aluminum strain reliefs with or without integral flex relief. This type of flex relief features a design similar to that of the old "Chinese finger torture" devices. As pull on the wire increases, the flex style relief's grip on the cable increases, reinforcing the strength of the connection to your equipment. These strain reliefs are designed to accommodate larger cables ranging from 15.9 to 49.2 mm.

Panel Components Corporation also offers conduit (see pages 163) for use with SM-nipples or elbows. This highly flexible corrugated conduit is made of Nylon 6/6, and is flame retardant and self-extinguishing. It features excellent crush resistance, and resistance to heat, UV-exposure, and certain chemicals. Wires or cable are threaded through conduit in situations where the wire and cable need extra protection (from elements or physical damage) or where users may need to add additional wires at a later time.

The SM-push-in conduit system (see page 162-163) connects flexible nylon conduit to a push-in fitting. The polyamide SM-nipples feature a ridge that snaps into the grooves of the corrugated conduit to hold the conduit in place. The conduit can be mounted turnable for non-liquid tight applications by pushing the conduit into the fitting until it stops. For rigid liquid tight applications the conduit should be pushed farther into the fitting until it clicks again. These fittings are available in the nipple version or the 90° elbow version.

Make strain relief assembly simple with a deep socket wrench (see page 164). These tools are made of alloy steel, which makes them handy and light weight. The tools are slit open along the full length of the socket to accommodate the installed cable during tightening of the dome nut and some flex nuts. The deep socket wrench is available in 4 sizes.

The first step in specifying Interpower™ strain reliefs is to determine which general type will work best. For applications requiring small to medium sized cordage, we offer the strain reliefs shown on pages 151-159. The aluminum strain relief types shown on pages 160-161offer the best performance for larger cordage sizes.

Depending on your application, you may wish to specify a strain relief with integral flex relief. The flex relief protects the cord from stress that is applied perpendicular to the axis of its entry into the equipment.

The last step is to select the correct size strain relief for the cord with which it will be used.

After installing the cordage and strain relief, your product should be able to pass a pull test. UL calls for the most stringent pull test which consists of a 13.5 kilogram weight fixed to the cordage for 1 minute. After the test, a visual inspection is done to determine if the cordage has slipped from the strain relief.

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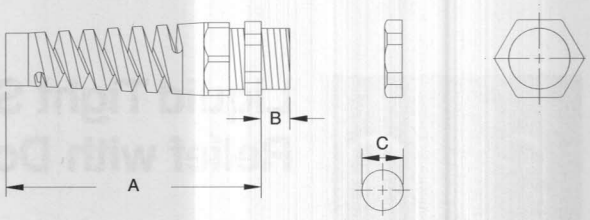
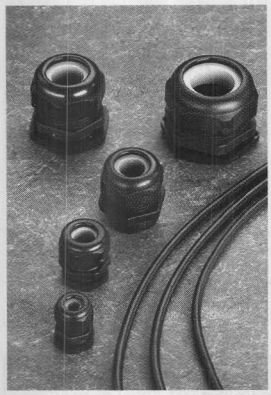
Flex Style Liquid Tight Strain Relief



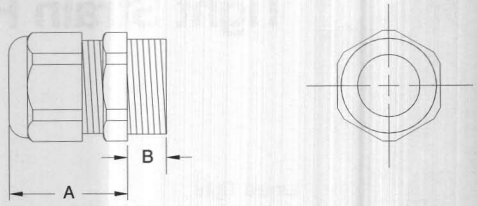
Liquid Tight
Approvals: UL, CSA, VDE
Materials: Nylon 6/6 self-extinguishing
Seal: Buna-N
Protection: IP 68 (10.5 kg/m²) (DIN 40050) Within the specified clamping range

Operating temperature:
Static -40° to 100°C
Short time exposure 120°C
Dynamic -20° to 80°C
Short time exposure 100°C
Color: Black is standard; gray is available special order

Part Number	Cable Diameter (mm)	Thread Type	Clearance(C) Hole (mm)	Body (A) Length (mm)	Thread (B) Length (mm)	Wrenching Flats (mm)	Torque Settings (N.m.)
85820020	4.06 – 7.87	3/8" NPT	17.27	58.93	14.99	22/19	2.5
85820040	6.10 – 11.94	1/2" NPT	21.08	81.03	12.95	24	2.5
85820050	9.91 – 14.22	1/2" NPT	21.08	92.96	12.95	27	2.5
85820060	12.94 – 18.03	3/4" NPT	26.67	111.00	12.95	33	5.0
85820110	2.79 – 6.60	PG7	12.45	49.02	7.87	15	1.7
85820120	4.06 – 7.87	PG9	15.24	58.93	7.87	19	2.5
85820130	5.09 – 9.91	PG11	18.54	71.12	7.87	22	2.5
85820140	6.10 – 11.94	PG13	20.32	81.03	8.89	24	2.5
85820150	9.91 – 14.22	PG16	22.35	92.96	9.9	27	3.3
85820160	12.94 – 18.03	PG21	28.8	111.00	10.92	33	5.0
85820210	2.03 – 5.09	PG7	12.45	49.02	7.87	15	1.7
85820220	2.03 – 6.10	PG9	15.24	58.93	7.87	19	2.5
85820230	2.79 – 7.11	PG11	18.45	71.12	7.87	22	2.5
85820240	5.09 – 8.89	PG13	20.32	81.03	8.89	24	2.5
85820250	7.11 – 11.94	PG16	22.35	92.96	9.91	27	3.3
85820260	8.89 – 16.00	PG21	28.45	111.00	10.92	33	5.0
85820320	2.03 – 6.10	3/8" NPT	17.27	58.93	14.99	22/19	2.5
85820340	5.09 – 8.89	1/2" NPT	21.08	81.03	12.95	24	2.5
85820350	7.11 – 11.94	1/2" NPT	21.08	92.96	12.95	27	2.5
85820360	8.89 – 16.00	3/4" NPT	26.67	111.00	12.95	33	5.0



Liquid Tight Strain Relief with Dome Nut



Easy installation: requires one twist to tighten cap.
Approvals: UL, CSA, VDE
Materials: Nylon 6/6 self-extinguishing
Seal: Buna-N
Protection: IP 68 (10.5 kg/m²) (DIN 40050) Within the specified clamping range

Operating temperature:
Static -40° to 100°C
Short time exposure 120°C
Dynamic -20° to 80°C
Short time exposure 100°C
Color: Black is standard; gray is available special order

Part Number	Cable Diameter (mm)	Thread Type	Clearance Hole (mm)	Body (A) Length (mm)	Thread (B) Length (mm)	Wrenching Flats (mm)	Torque Settings (N.m)
85820510	2.79 – 6.60	PG7	12.45	20.07	7.87	15	1.7
85820610	2.03 – 5.08	PG7	12.45	20.07	7.87	15	1.7
85820520	4.06 – 7.87	PG9	15.24	22.10	7.87	19	2.5
85820620	2.03 – 6.10	PG9	15.24	22.10	7.87	19	2.5
85820420	4.06 – 7.87	3/8" NPT	17.27	22.10	14.99	22/19	2.5
85820720	2.03 – 6.10	3/8" NPT	17.27	22.10	14.99	22/19	2.5
85820530	5.08 – 9.91	PG11	18.54	23.88	7.87	22	2.5
85820630	2.79 – 7.11	PG11	18.54	23.88	7.87	22	2.5
85820540	6.10 – 11.94	PG13	20.32	26.92	8.89	24	2.5
85820640	5.08 – 8.89	PG13	20.32	26.92	8.89	24	2.5
85820440	6.10 – 11.94	1/2" NPT	21.08	26.92	12.95	24	2.5
85820740	5.08 – 8.89	1/2" NPT	21.08	26.92	12.95	24	2.5
85820450	9.91 – 14.22	1/2" NPT	21.08	27.94	12.95	27	2.5
85820750	7.11 – 11.94	1/2" NPT	21.08	27.94	12.95	27	2.5

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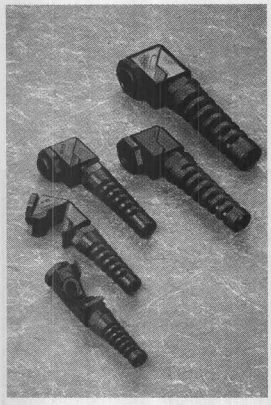
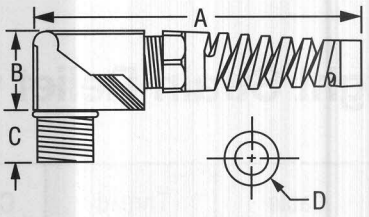
Liquid Tight Strain Relief with Dome Nut cont.

Part Number	Cable Diameter (mm)	Thread Type	Clearance Hole (mm)	Body (A) Length (mm)	Thread (B) Length (mm)	Wrenching Flats (mm)	Torque Settings (N.m)
85820550	9.91 – 14.22	PG16	22.35	27.94	9.91	27	3.3
85820650	7.112 – 11.94	PG16	22.35	27.94	9.91	27	3.3
85820560	12.95 – 18.03	PG21	28.45	29.97	10.92	33	5.0
85820660	8.89 – 16.00	PG21	28.45	29.97	10.92	33	5.0
85820460	12.95 – 18.03	3/4" NPT	26.67	29.97	12.95	33	5.0
85820760	8.89 – 16.00	3/4" NPT	26.67	29.97	12.95	33	5.0
85820570	18.03 – 24.89	PG29	37.34	38.10	10.92	42	5.0
85820670	12.95 – 20.07	PG29	37.34	38.10	10.93	42	5.0
85820470	18.03 – 24.89	1" NPT	34.29	38.10	19.05	42	5.0
85820770	12.95 – 20.07	1" NPT	34.29	38.10	19.05	42	5.0
85820870	18.03 – 24.89	1 1/4" NPT	41.91	38.10	16.00	46/42	5.0
85820970	12.95 – 24.64	1 1/4" NPT	41.91	38.10	16.00	46/42	5.0
85820580	21.84 – 32.00	PG36	46.99	44.96	12.95	53	5.0
85820680	20.07 – 25.91	PG36	46.99	44.96	12.95	53	5.0
85820480	21.84 – 32.00	1 1/2" NPT	48.77	44.96	20.07	53	5.0
85820780	20.07 – 25.91	1 1/2" NPT	48.77	44.96	20.07	53	5.0
85820590	32.00 – 38.10	PG42	54.10	46.99	12.95	60	5.0
85820690	24.89 – 30.99	PG42	54.10	46.99	12.95	60	5.0
85820600	36.83 – 43.94	PG48	58.44	46.99	13.97	65	5.0
85820700	28.96 – 35.05	PG48	58.44	46.99	13.97	65	5.0



90° Liquid Tight Strain Relief Snap Elbow with Flex Nut



Liquid Tight
Approvals: UL, CSA, VDE
Materials: Nylon 6/6 self-extinguishing
Seal: Buna-N
Protection: IP 68 (10.5 kg/m²) (DIN 40050) Within the specified clamping range

Operating temperature:
Static -40° to 100°C,
Short time exposure 120°C
Dynamic -20° to 80°C
Short time exposure 100°C
Color: Black is standard; gray is available special order

Part Number	Cable Diameter (mm)	Thread Type	Clearance (D) Hole (mm)	Body (A) Length (mm)	Height (B) (mm)	Thread (C) Length (mm)	Torque Settings (N.m)
85822020	4.06 – 7.87	3/8" NPT	17.27	85.09	23.11	14.99	2.5
85822040	6.10 – 11.94	1/2" NPT	21.08	112.01	30.48	12.95	2.5
85822060	8.89 – 16.00	3/4" NPT	26.67	154.94	39.88	12.95	5.0
85822120	4.06 – 7.87	PG9	15.24	85.09	23.11	7.87	2.5
85822130	5.09 – 9.91	PG11	18.54	98.04	26.92	7.87	2.5
85822140	6.10 – 11.94	PG13	20.32	112.01	30.48	8.89	2.5
85822150	9.91 – 14.22	PG16	22.35	124.97	32.51	9.91	3.3
85822160	12.94 – 18.03	PG21	28.45	154.94	39.88	10.92	5.0
85822220	2.03 – 6.10	PG9	15.24	85.09	23.11	7.87	2.5
85822230	2.79 – 7.11	PG11	18.54	98.04	26.92	7.87	2.5
85822240	5.09 – 8.89	PG13	20.32	112.01	30.48	8.89	2.5
85822250	7.11 – 11.94	PG16	22.35	124.97	32.51	9.91	3.3
85822260	8.89 – 16.00	PG21	28.45	154.94	39.88	10.92	5.0
85822320	2.03 – 6.10	3/8" NPT	17.27	85.09	23.11	14.99	2.5
85822340	5.09 – 8.89	1/2" NPT	21.08	112.01	30.48	12.95	2.5
85822350	7.11 – 11.94	1/2" NPT	21.08	130.30	32.51	12.95	2.5
85822360	8.89 – 16.00	3/4" NPT	26.67	154.94	39.88	12.95	5.0

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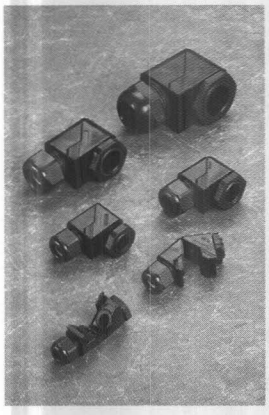
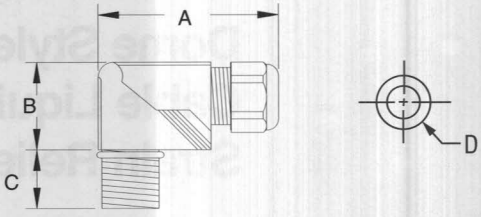


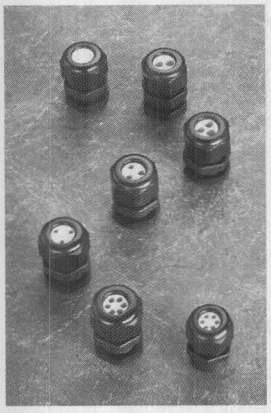
90° Strain Relief Snap Elbow with Dome Nut



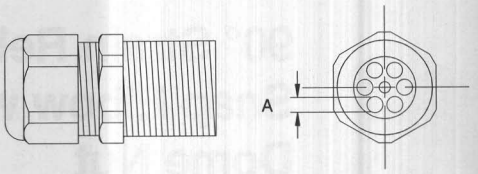
Materials: Nylon 6/6 self-extinguishing
Seal: Buna-N
O-Ring Buna-N
Protection IP 68 (10.5 kg/m²)
Color: Black is standard;
gray is available special order

Operating temperature:
Static -40° to 100°C
Short time exposure 120°C
Dynamic -20° to 80°C
Short time exposure 100°C
Approvals: UL, CSA

Part Number	Cable Diameter (mm)	Thread Type	Clearance (D) Hole (mm)	Body (A) Length (mm)	Height (B) (mm)	Thread (C) Length (mm)	Torque Settings (N.m)
85822420	4.06-7.87	3/8" NPT	17.27	45.47	22.11	14.98	2.5
85822440	6.10-11.94	1/2" NPT	21.08	56.90	30.48	12.95	2.5
85822450	9.06-14.22	1/2" NPT	21.08	59.50	30.50	12.95	2.5
85822460	12.95-18.03	3/4" NPT	26.67	72.90	39.88	12.95	5.0
85822520	4.06-7.87	PG9	15.24	45.47	23.00	7.87	2.5
85822530	5.0-10.00	PG11	18.54	50.55	27.00	7.87	2.5
85822540	6.10-11.94	PG13	20.32	56.90	30.48	8.89	2.5
85822550	10.00-14.22	PG16	22.35	59.44	32.51	10.00	3.3
85822560	12.95-18.03	PG21	28.45	72.90	39.88	10.92	5.0
85822570	18.03-24.89	PG29	37.34	90.93	51.05	10.92	5.0
85822620	2.03-6.10	PG9	15.24	45.47	23.00	7.87	2.5
85822630	3.00-7.00	PG11	18.54	50.55	27.00	7.87	2.5
85822640	5.08-8.89	PG13	20.32	57.00	30.48	8.99	2.5
85822650	7.11-11.94	PG16	22.35	59.44	32.51	10.00	3.3
85822660	8.99-16.00	PG21	28.45	72.90	39.88	10.92	5.0
85822670	12.95-20.07	PG29	37.34	90.93	51.05	10.92	5.0
85822720	2.03-6.10	3/8" NPT	17.27	45.47	23.00	14.98	2.5
85822740	5.08-8.89	1/2" NPT	21.08	57.00	30.48	12.95	2.5
85822750	7.11-11.94	1/2" NPT	21.08	59.50	30.50	12.95	2.5
85822760	8.99-16.00	3/4" NPT	26.67	72.90	39.88	12.95	5.0



Dome Style Multi Cable Liquid Tight Strain Relief



Materials: Nylon 6/6 self-extinguishing
Seal: Buna-N
O-Ring Buna-N
Protection IP 68 (10.5 kg/m²)
Color: Black is standard; gray is available special order

Operating temperature:
Static -40° to 100°C
Short time exposure 120°C
Dynamic -20° to 80°C
Short time exposure 100°C

Part Number	Thread Type	Number of Holes	Dia. of Holes (A) (mm)
85825000	PG9	4	1.52
85825010	PG9	2	3.05
85825020	PG9	Solid Plug	
85825030	PG11	2	3.05
85825040	PG11	3	3.05
85825050	PG11	2	4.06
85825060	PG11	Solid Plug	
85825070	PG13	3	2.03
85825080	PG13	6	3.05
85825090	PG13	3	4.06
85825100	PG13	2	5.08
85825110	PG13	Solid Plug	
85825120	PG16	3	3.05
85825130	PG16	3	4.06
85825140	PG16	4	4.06
85825150	PG16	5	4.06
85825160	PG16	6	4.06
85825170	PG16	2	6.10
85825180	PG16	3	5.59
85825190	PG16	Solid Plug	

Part Number	Thread Type	Number of Holes	Dia. of Holes (A) (mm)
85825200	PG21	4	6.10
85825210	PG21	3	7.11
85825220	PG21	2	7.87
85825230	PG21	Solid Plug	
85825240	PG29	6	6.60
85825250	PG29	4	9.00
85825260	PG29	Solid Plug	
85825270	PG36	6	7.87
85825280	PG36	5	8.89
85825290	PG36	7	8.89
85825300	PG36	2	14.99
85825310	PG36	Solid Plug	
85825320	PG42	Solid Plug	
85825340	PG48	8	9.97
85825350	PG48	6	11.94
85825360	PG48	3	18.03
85825370	PG48	Solid Plug	
85826000	3/8"NPT	4	1.52
85826010	3/8"NPT	2	3.05
85826020	3/8"NPT	Solid Plug	

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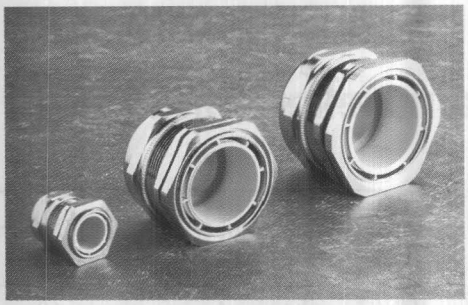
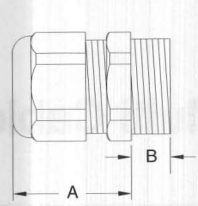
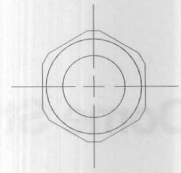
85826030	1/2"NPT	3	2.00
85826040	1/2"NPT	6	3.05
85826050	1/2"NPT	3	4.06
85826060	1/2"NPT	2	5.08
85826070	1/2"NPT	Solid Plug	
85826080	1/2"NPT	3	3.05
85826090	1/2"NPT	3	4.06
85826100	1/2"NPT	4	4.06
85826110	1/2"NPT	5	4.06
85826120	1/2"NPT	6	4.06
85826130	1/2"NPT	2	6.10
85826140	1/2"NPT	3	5.59
85826150	1/2"NPT	Solid Plug	

85826160	3/4"NPT	4	6.10
85826170	3/4"NPT	3	7.11
85826180	3/4"NPT	2	7.87
85826190	3/4"NPT	Solid Plug	
85826200	1"NPT	6	6.60
85826210	1"NPT	4	8.89
85826220	1"NPT	Solid Plug	
85826230	1 1/2"NPT	6	7.87
85826240	1 1/2"NPT	5	8.89
85826250	1 1/2"NPT	7	8.89
85826260	1 1/2"NPT	2	14.99
85826270	1 1/2"NPT	Solid Plug	



Dome Style Nickel Plated Brass Strain Relief





Easy installation: requires one twist to tighten cap.
Approvals: UL, CSA, VDE
Materials: Nickel Plated Brass
Seal: Buna-N
O-Ring: Buna-N

Protection: IP 68 (10.5 kg/m²)
Operating temperature:
Static -40° to 100°C
Short time exposure 120°C
Color: Black is standard; gray is available special order

Part Number	Cable Diameter (mm)	Thread Type	Clearance Hole (mm)	Thread (B) Length (mm)	Body (A) Length (mm)	Wrenching Flats (mm)
85824020	4.07-7.87	3/8" NPT	17.27	14.99	20.07	19.05
85824040	6.10-11.94	1/2" NPT	21.08	12.95	22.10	24.00
85824060	12.95-18.03	3/4" NPT	26.67	12.95	24.89	30.00
85824110	3.00-6.50	PG7	12.45	5.08	19.05	13.97
85824120	4.06-7.87	PG9	15.24	6.10	20.07	17.02
85824130	5.08-10.00	PG11	18.54	6.10	21.08	20.07
85824140	6.10-11.94	PG13	20.32	6.60	22.10	22.10
85824150	10.00-14.22	PG16	22.35	6.60	23.00	24.00
85824160	12.95-18.03	PG21	22.45	7.11	24.89	30.00
85824170	18.03-24.89	PG29	37.34	8.00	28.96	40.00
85824180	22.00-32.00	PG36	46.99	8.00	35.02	50.04
85824190	32.00-38.10	PG42	54.10	8.99	37.08	56.90
85824200	36.83-43.94	PG48	9.45	10.00	38.10	64.01
85824210	2.03-5.08	PG7	12.45	5.08	19.05	13.97
85824220	2.03-6.10	PG9	15.24	6.10	20.07	17.02
85824230	3.00-7.11	PG11	18.54	6.10	21.08	20.07
85824240	5.08-8.99	PG13	20.32	6.60	22.10	22.10
85824250	7.11-11.94	PG16	22.35	6.60	23.00	24.00
85824260	8.99-16.00	PG21	22.45	7.11	24.89	30.00
85824270	12.95-20.07	PG29	37.34	8.00	28.96	40.00

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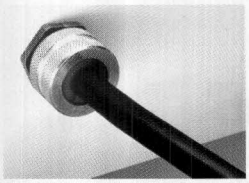
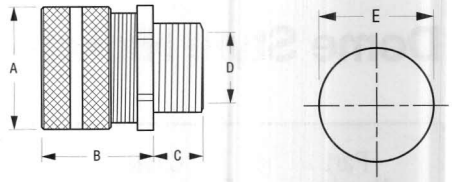
Dome Style Nickel Plated Brass Strain Relief cont.

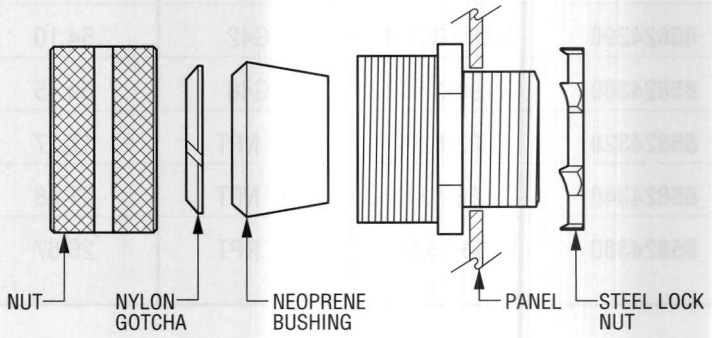
Part Number	Cable Diameter (mm)	Thread Type	Clearance Hole (mm)	Thread (B) Length (mm)	Body (A) Length (mm)	Wrenching Flats (mm)
85824280	20.07-25.91	PG36	46.99	8.00	35.02	50.04
85824290	24.89-30.99	PG42	54.10	8.99	37.08	56.90
85824300	28.96-35.02	PG48	59.45	10.00	38.10	64.01
85824320	2.03-6.10	3/8" NPT	17.27	14.99	20.07	19.05
85824340	5.08-8.99	1/2" NPT	21.08	12.95	22.10	24.00
85824360	8.99-16.00	3/4" NPT	26.67	12.95	24.89	30.00



Strain Reliefs for Larger Cordage Sizes



Approvals: UL listed, CSA certified
Materials: Aluminum; nylon rings; Neoprene bushing
Operating temperature:
Static -34° to 107°C
(to 115°C on models 888 SHC 1061 and 888 SHC 1071)
Suitable for use in hazardous locations per Class 1. Div. 2; Class II, Div. 1 & 2; Class III, Div. 1 & 2; NEC Reference 501-4 (b), 502-4 (a), 502-4 (b), 503-3 (a), 503-3 (b).



Part Number	Cable Diameter (mm)	Outer (A) Diameter (mm)	Body (B) Length (mm)	Thread (C) Length (mm)	Inner (D) Diameter (mm)	Mounting (E) Hole (mm)
888 SHC 1041	15.9-19.0	44.40	40.70	18.00	25.90	34.5-35.7
888 SHC 1052	25.4-28.6	58.70	43.20	18.80	32.00	43.7-44.9
888 SHC 1053	28.6-31.8	58.67	43.20	18.80	32.00	43.7-44.9
888 SHC 1061	34.9-38.1	76.20	43.90	19.00	38.10	50.0-51.2
888 SHC 1071	46.0-49.2	97.8	43.60	22.40	49.30	62.3-63.5

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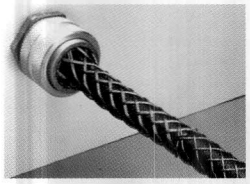
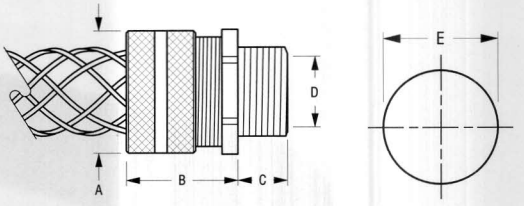
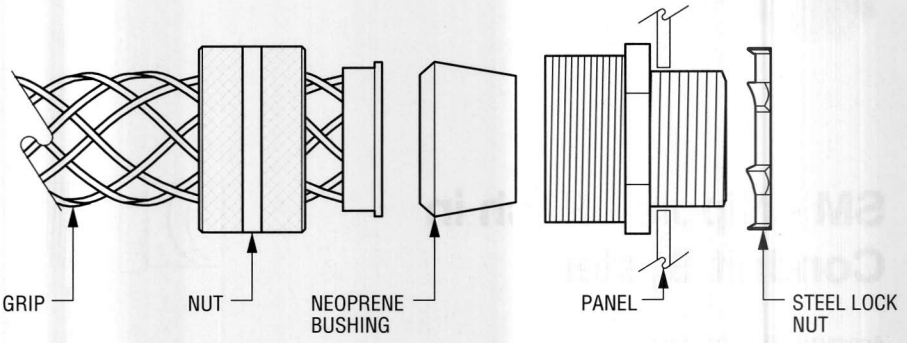


Strain Reliefs for Larger Cordage Sizes with Integral Flex Relief

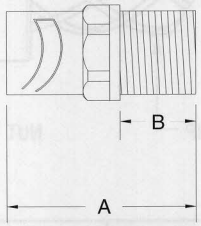


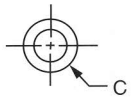
Approvals: UL listed, CSA certified
Materials: Aluminum; nylon rings; Neoprene bushing
Operating temperature:
Static -34° to 107°C
Suitable for use in hazardous locations per Class 1. Div. 2; Class II, Div. 1 & 2; Class III.



Part Number	Cable Diameter (mm)	Outer (A) Diameter(mm)	Body (B) Length (mm)	Thread (C) Length (mm)	Inner (D) Diameter (mm)	Mounting (E) Hole (mm)
888 074 01 021	15.9-19.0	44.40	40.60	18.00	25.90	34.5-35.7
888 074 01 023	19.0-22.3	44.40	40.60	18.00	25.90	34.5-35.7
888 074 01 027	25.4-28.6	58.70	43.20	18.80	32.00	43.7-44.9
888 074 01 028	28.6-31.8	58.70	43.20	18.80	32.00	43.7-44.9
888 074 01 1261	46.0-49.2	97.80	68.60	22.40	49.30	62.3-63.5

SM - Nipple - Push in Conduit System





Approvals: UL Recognized
Materials: Nylon 6/6
Color: Black

Part Number	Thread Type	Clearance (C) Hole (mm)	Thread (B) Length (mm)	Body (A) Length (mm)	Wrenching Flats (mm)
85826500	PG9	15.20	9.00	23.11	17.00
85826510	3/8"NPT	17.27	14.99	23.11	17.00
85826520	PG11	18.54	9.00	25.00	22.10
85826530	PG13	20.32	8.89	28.00	23.88
85826540	PG16	22.35	9.91	29.00	27.00
85826550	1/2"NPT	21.08	12.95	29.00	27.00
85826560	PG21	28.45	10.92	32.00	35.00
85826570	3/4"NPT	26.67	12.95	32.00	35.00
85826580	PG29	37.34	10.92	35.00	42.00
85826590	1"NPT	34.29	15.00	35.00	42.00
85826600	PG36	46.99	12.95	40.89	50.04
85826610	PG48	59.44	13.97	45.97	64.00

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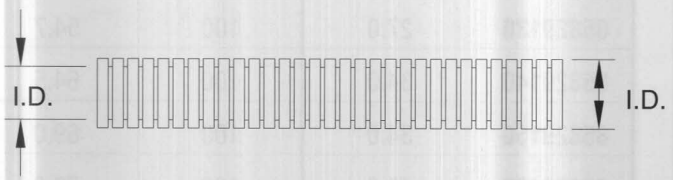
Materials: Nylon 6/6
O-Ring: Buna-N

-20° to 80° C
Color: Black

Part Number	Thread Type	Clearance (D) Hole (mm)	Thread (C) Length (mm)	Body (A) Length (mm)	Height (B) (mm)	Wrenching Flats (mm)
85826500	PG9	15.27	8.00	43.00	23.11	19.00
85826510	3/8"NPT	17.27	15.00	43.00	23.11	19.00
85826520	PG11	18.54	8.00	48.00	27.00	22.10
85826530	PG13	20.32	9.00	52.00	30.48	24.00
85826540	PG16	22.35	10.00	56.00	32.51	27.00
85826550	1/2"NPT	21.08	13.00	56.00	32.51	27.00
85826560	PG21	28.45	11.00	70.00	40.00	33.00
85826570	3/4"NPT	26.67	13.00	70.00	40.00	33.00
85826580	PG29	37.34	11.00	83.00	51.50	41.91
85826590	1"NPT	34.29	15.00	83.00	51.50	41.91

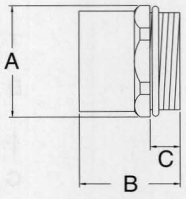
Conduit

Approvals: UL Recognized
Materials:
Nylon 6/6
Flame retardant & self-extinguishing
Crush resistant
Resistant to heat, UV-exposure and certain chemicals.
Operating Temp:
-40° to 110° C
Color: Black



Part Number	I.D. (mm)	O.D. (mm)
85827000	9.91	12.95
85827010	11.94	15.49
85827020	13.94	18.42
85827030	16.51	21.08
85827040	22.61	28.45
85827050	28.45	34.54
85827060	36.04	41.91
85827070	47.50	54.10

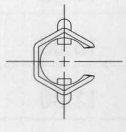
Adapters
PG to NPT

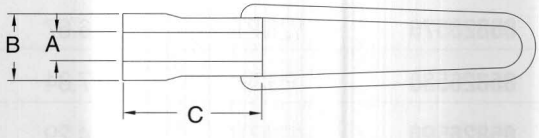


Converts PG threads to NPT threads
Materials: Nickel Plated Brass
Seal: Buna-N

Part Number	Male Type	Female Hole (mm)	Body (B) Length (mm)	Thread (C) Length (mm)	Height (A) (mm)
85800400	PG11	½"NPT	26.92	6.10	22.86
85826510	PG13	½"NPT	26.92	6.60	22.86
85826520	PG16	½"NPT	26.92	6.60	22.86
85826530	PG21	½"NPT	33.02	7.11	23.88
85826540	PG21	¾"NPT	33.02	7.11	23.88
85826550	PG29	1"NPT	40.89	7.87	28.96

Deep Socket Wrenches





Materials: Alloy Steel

Part Number	Inside (A) Dia. (mm)	Socket (C) Length (mm)	Width (B) (mm)
85829000	8.5	60	19.5
85829010	8.5	60	19.5
85829020	10.0	60	23.5
85829030	10.0	60	25.3
85829040	12.0	60	27.0
85829050	12.0	60	29.5
85829060	14.0	60	31.9
85829070	16.0	60	35.5
85829080	20.0	60	40.80

Part Number	Inside (A) Dia. (mm)	Socket (C) Length (mm)	Width (B) (mm)
85829090	20.0	60	43.8
85829100	24.0	60	47.8
85829110	27.0	100	52.5
85829120	27.0	100	53.5
85829130	27.0	100	54.7
85829140	34.0	100	64.5
85829150	34.0	100	69.0
85829160	40.0	100	78.0

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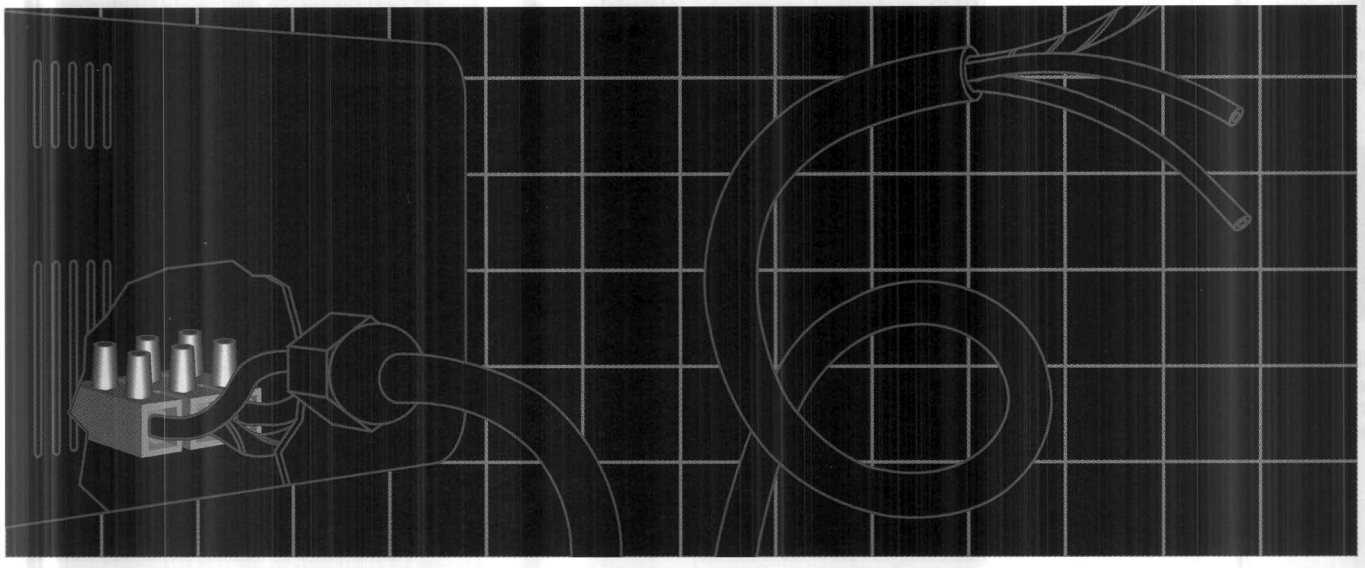
Terminal Blocks



The terminal blocks described in this section are intended specifically for use in making the internal connection between the power cord and the primary circuitry of the equipment. Three-contact terminal blocks provide connection points in single phase applications with contacts for line, neutral, and ground. Five-contact terminal blocks are used in three-phase applications with contacts for three lines, neutral or common, and ground.

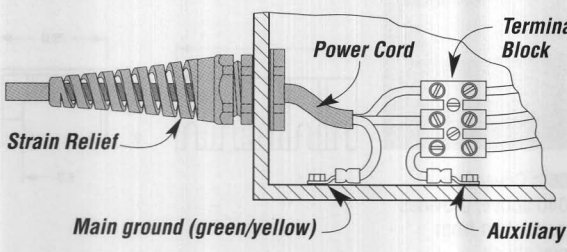
International power entry connection practices, as outlined in IEC 60335* and other international equipment standards, are different from practices commonly observed in North America and officially sanctioned by UL and CSA. International standards require that equipment using permanently attached power cords be constructed such that cords can be disconnected and removed from the equipment without the use of any specialized tools such as soldering irons. Screwdrivers and wrenches are allowed. The theory behind these requirements is that equipment repair is likely to take place at the user location and be performed by personnel who have a limited understanding of the equipment itself. The assumption is that tools and skills may be limited and therefore, the power cord connection process should be simple.

The drawing below at left illustrates an installation that complies with international requirements. The cord enters the product through a strain relief, which can be released by using a wrench. It does not have to be removed from the panel in order to release the cable. Strain reliefs are discussed in the preceding section beginning on page 147.

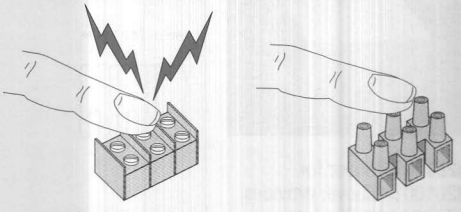
The cord is attached to a terminal block which is constructed so that a screwdriver is the only tool required to connect or disconnect it. Solder-type terminal strips are not permissible.

The terminal block must be constructed so that creepage and clearance distances between lines as well as line and ground are maintained. Finally, the insulation construction must prevent contact with current-carrying surfaces in an attempt to eliminate the possibility of accidental shock. This is accomplished on the terminal blocks (illustrated below) by recessing screws and contacts, so that they are screwdriver accessible only. In this case, screwdriver accessibility means that the standard test finger, which is described in international standards, can not touch current-carrying surfaces when the terminal block is assembled with wires in place. Standard North American terminal blocks do not satisfy this requirement.

International terminal block connections



International terminal block has recessed screws and contacts



North American terminal block

International terminal block

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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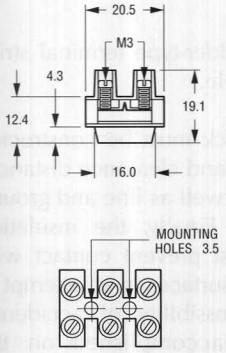
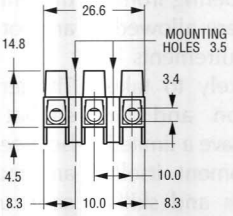
with 3-wire cable up to 2.5mm² (wire protectors limit wire size).

NEMKO	2.5mm²	380V
OVE †	2.5mm²	380V
SEMKO	4.0mm²	380V
FIMKO	2.5mm²	500V
SEV	2.5mm²	500V
UL	12-22 AWG	30A/300V
VDE	2.5mm²	380V

† Approved on ground-wire connection

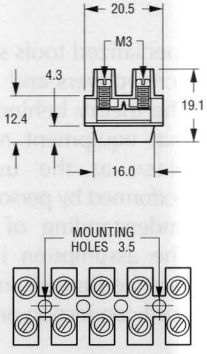


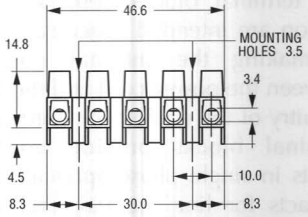


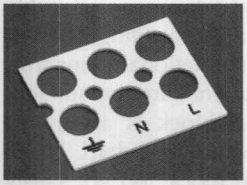
with 5-wire cable up to 2.5mm² (wire protectors limit wire size).

NEMKO	2.5mm²	380V
OVE †	2.5mm²	380V
SEMKO	4.0mm²	380V
FIMKO	2.5mm²	500V
SEV	2.5mm²	500V
UL	12-22 AWG	30A/300V
VDE	2.5mm²	380V

† Approved on ground-wire connection

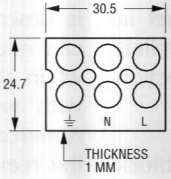


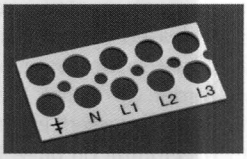




82010021: Marking label for 82010010 above. Premarked as shown.

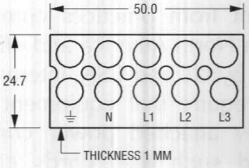
Marking Label

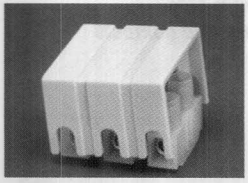




82010051: Marking label for 82010040 above. Premarked as shown.

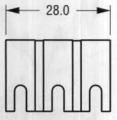
Marking Label

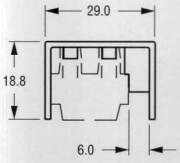


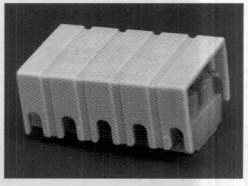


82010030: Cover for 82010010 above; provides added protection from accidental shock.

Cover (cannot be used with marking label)

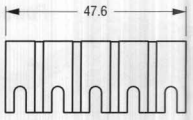


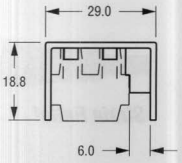




82010060: Cover for 82010040 above; provides added protection from accidental shock.

Cover (cannot be used with marking label)





Dimensions are in mm

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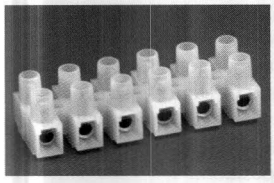
Terminal Blocks—up to 2.5mm² conductor size, cont.

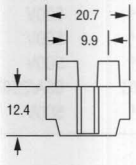


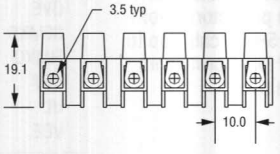
82010200: Terminal block with wire protectors—for use with 6-wire cable up to 2.5mm² (wire protectors limit wire size).

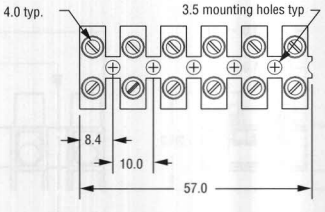
Terminal block for 6-wire cordage

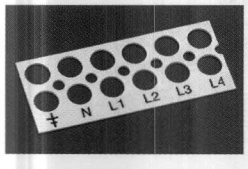
Agency	Maximum Wire Size	Maximum Rating
BSI		10A
CEBEC	2.5mm²	380V
CSA	12-24 AWG	25A/300V
DEMKO	2.5mm²	380V
KEMA	4.0mm²	380V
NEMKO	2.5mm²	380V
OVE †	2.5mm²	380V
SEMKO	4.0mm²	380V
FIMKO	2.5mm²	500V
SEV	2.5mm²	500V
UL	12-22 AWG	30A/300V
VDE	2.5mm²	380V

† Approved on ground-wire connection



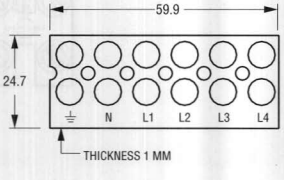


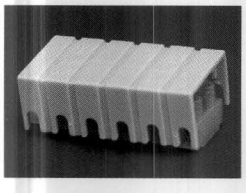




82010211: Marking label for 82010200 above. Premarked as shown in photo.

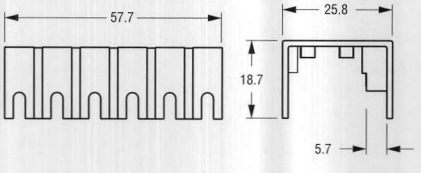
Marking Label





82010220: Cover for 82010200 above; provides added protection from accidental shock.

Cover (cannot be used with marking label)

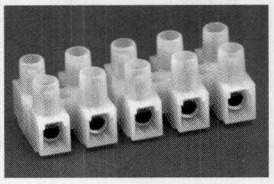


Terminal Block—up to 6.0mm² conductor size

Complies with VDE 0700/0720/0730 on electrical equipment up to 32A; also complies with requirements for 8mm minimum creepage and clearance distances. Natural color polyamide with continuous working temperature of 100°C; can withstand 160°C for short periods.

Materials: Inserts are tinned brass; screws are steel-plated with zinc and yellow chrome; wire protectors are stainless spring steel. Label: white plastic. Cover: Gray polystyrene for working temperature of 70°C.

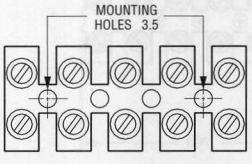
Approvals: See chart below.

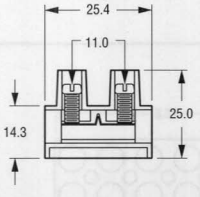


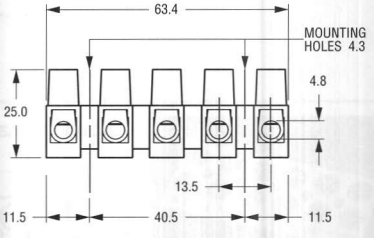
82010071: Terminal block with wire protectors—for use with 5-wire cable up to 6.0mm² (wire protectors limit wire size).

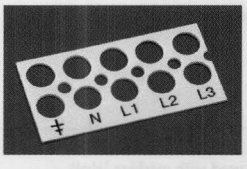
Terminal block for 5-wire cordage

Agency	Maximum Wire Size	Maximum Rating
CSA	8-18 AWG	55A/300V
DEMKO	6.0mm²	500V
KEMA	6.0mm²	500V
NEMKO	6.0mm²	500V
OVE	6.0mm²	500V
SEMKO	6.0mm²	500V
FIMKO	6.0mm²	500V
SEV	6.0mm²	500V
UL	10-18 AWG	40A/300V
VDE	6.0mm²	500V



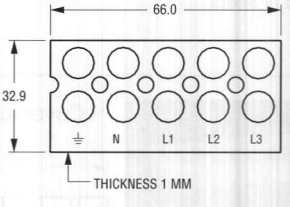


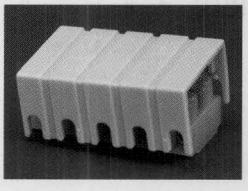




82010181: Marking label for 82010071 above. Premarked as shown in photo.

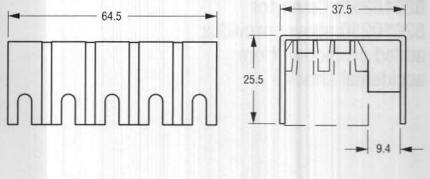
Marking Label





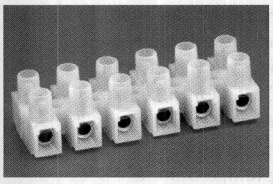
82010091: Cover for 82010071 above; provides added protection from accidental shock.

Cover (cannot be used with marking label)



Dimensions are in mm

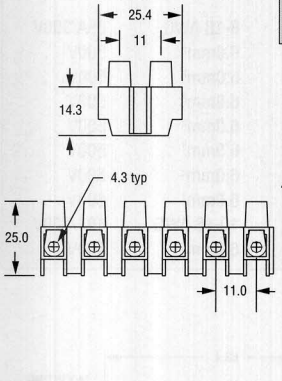
Terminal Block—up to 6.0mm² conductor size, cont.

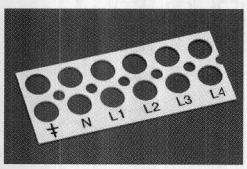


82010230: Terminal block with wire protectors—for use with 6-wire cable up to 6.0mm² (wire protectors limit wire size).

Terminal block for 6-wire cordage

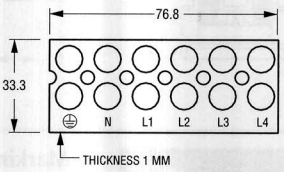
Agency	Maximum Wire Size	Maximum Rating
CSA	8-18 AWG	55A/300V
DEMKO	6.0mm²	500V
KEMA	6.0mm²	500V
NEMKO	6.0mm²	500V
OVE	6.0mm²	500V
SEMKO	6.0mm²	500V
FIMKO	6.0mm²	500V
SEV	6.0mm²	500V
UL	10-18 AWG	40A/300V
VDE	6.0mm²	500V

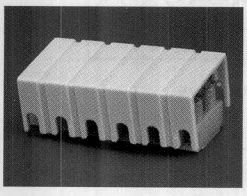




82010241: Marking label for 82010230 above. Premarked as shown in photo.

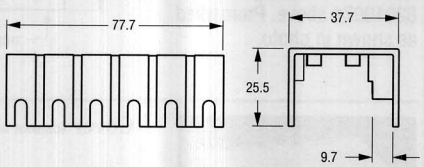
Marking Label





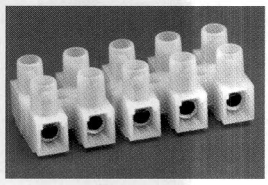
82010250: Cover for 82010230 above; provides added protection from accidental shock.

Cover (cannot be used with marking label)



Terminal Block—up to 10.0mm² conductor size

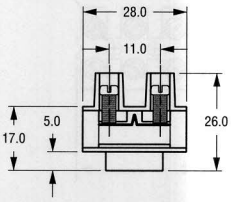
Complies with IEC 60685-1*, CSA C22.2 No. 158-1987, UL 1059, NEMKO 60.185 and ECN 584B, as well as SEMKO and FIMKO requirements. For use on electrical equipment up to 63A; also complies with requirements for minimum creepage and clearance distances in UL 1059. For continuous working temperature of 40°C; can withstand 80°C for short periods. Tightening torque 1.8 Nm per CSA; 20 inch pounds per UL.
Material: Natural color molded nylon composition.
Approvals: See chart below.

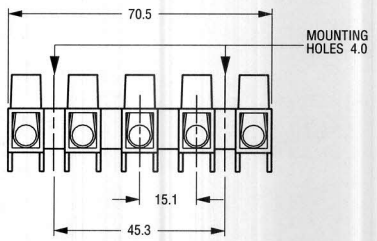


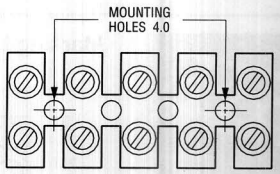
82010110: Terminal block with wire protectors—for use with 5-wire cable up to 10.0mm² (wire protectors limit wire size).

Terminal block for 5-wire cordage

Agency	Maximum Wire Size	Maximum Rating
CSA	6-22 AWG	70A/300V
DEMKO	10.0mm²	500V
KEMA	10.0mm²	500V
NEMKO	10.0mm²	500V
OVE	10.0mm²	500V
SEMKO	10.0mm²	500V
FIMKO	10.0mm²	500V
SEV	10.0mm²	500V
UL	8-14 AWG	65A/250V
VDE	10.0mm²	500V







Dimensions are in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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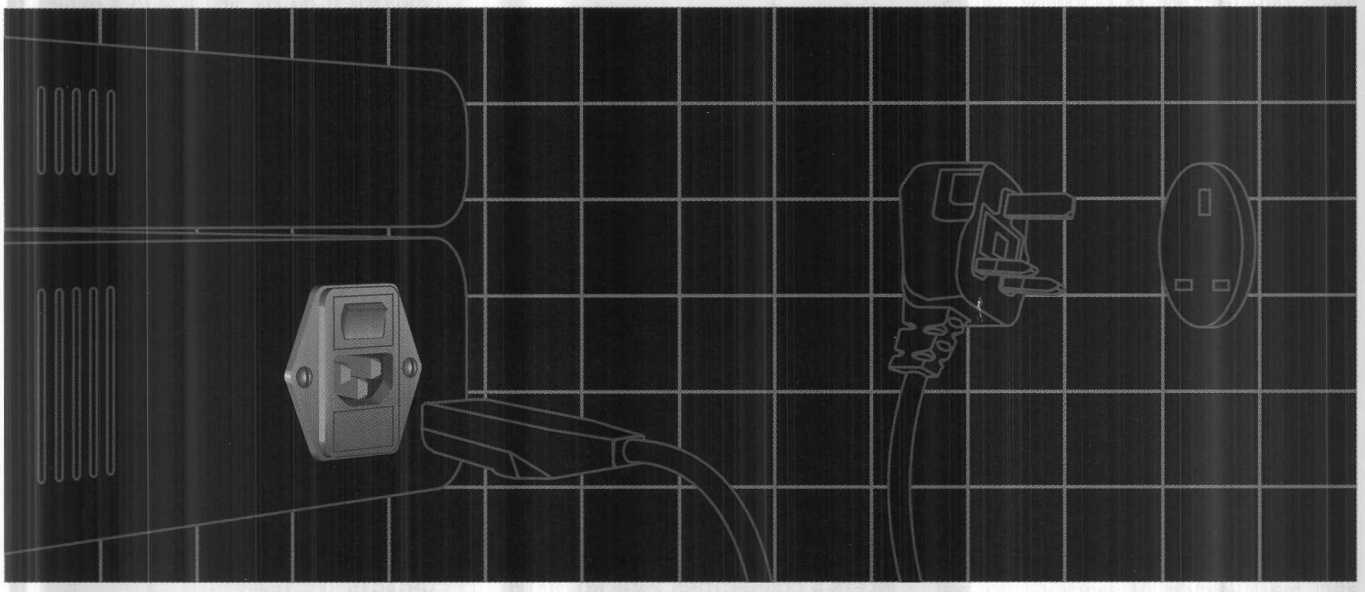
IEC 60320* Power Inlets & Multifunction Power Entry Modules



IEC 60320* Power Inlets and Connectors

The IEC 60320* AC power inlet is the most commonly used means of connecting a detachable cordset to electrical or electronic equipment that consumes up to 16A at 250V or less at operating temperatures up to 120°C. The connectors described in IEC 60320* standard sheets C13, C14, C15, C16, C19, and C20 are the most commonly specified standards. The IEC 60320* connector system is used not only in Europe and North America but throughout the industrialized world as well. By designing an IEC 60320* power inlet into a product, the manufacturer can attach the correct international cordset (i.e., a cordset with a British, Australian, Continental European or North American NEMA plug) just prior to shipment. This allows the equipment manufacturer to make one device for sale anywhere in the world.

10A/250VAC — International
15A/250VAC — North America

"Cold" Connectors (65°C)

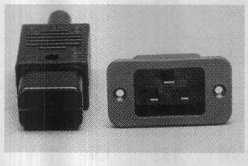
IEC 60320* standard sheet C13 describes a 10A, 250V connector for Class I equipment for cold conditions (65°C), measured at the contact.

The 10A rating on power inlet connectors requires that mating international cordsets rated at 10A use the larger 1.00mm² cordage. Panel Components' cordsets utilize the 1.00mm² cordage, thus permitting the 10A rating (with the exception of some British cordsets where the rating is limited by a fuse in the plug). The international cordsets in the Designer's Kit of International Cordsets on page 74 are rated at 10A.

10A/250VAC — International
15A/250VAC — North America

"Hot" Connectors (120°C)

For applications in which a 10 amp rating at 65°C is insufficient, IEC 60320* provides for an AC power connector with a 120°C rating, described in standard sheets C15 and C16. This connector includes a key which prevents insertion of the international connector intended for "cold" conditions.



16A/250VAC — International
20A/250VAC — North America

Detachable Connections at 16-20A

IEC 60320* C19 and C20 connectors allow the use of *detachable cordsets* rated at 16A European and 20A in North America (65°C). Higher power products which formerly required the use of permanently attached power cords or hard-wired connections via conduit can now exploit the convenience of a detachable cordset. A complete cordset for use in North America rated for service to 20A/250V could be constructed with the cable-terminated portion of this connector system on one end of a length of 12/3 cordage. Suitable wall plugs for connection at 120VAC can include the straight-blade NEMA 5-20P or the locking L5-20P (see pages 102-103). The product that uses a 20A plug in North America can, for export markets, use a Schuko plug, a United Kingdom plug, an Italian 16A plug, an Australian 15A plug, or the Indian plug on the end of 1.5mm² cordage equipped with this IEC connector. For Denmark or Switzerland whose plugs are only rated at 10A, it will be necessary to use IEC 60309* plugs shown on page 120.

Multifunction Power Entry Modules

When properly specified for a particular application, multifunction power entry modules offer one or more of the following benefits:

Increased safety: Because it is possible to interlock the power entry connector with access to other functions (i.e., a fuseholder and/or voltage selector), the equipment user can be forced to remove the power cord to change a fuse or adjust a voltage selector, for example. The probability of accidental shock related to these functions is thereby reduced.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Save space: Power entry modules combine several functions into one panel-mounting system, which saves panel space and eliminates duplicate sets of mounting flanges, hardware, and space required to access this hardware.

Save on assembly labor: Combination of several functional elements into one package reduces the number of component and hardware items that must be handled, thereby reducing installation labor costs. Connection labor costs may also be reduced because many power entry modules also provide the internal interconnections as part of the package. This may reduce the total connection count to three. (See power module selection chart on page 171 for a comparison of the number of contacts.)

Save on component management labor: Reduction of components avoids wasting valuable engineering resources by minimizing component documentation, testing, and maintenance of agency approval records. Materials management and purchasing costs associated with additional components is also reduced.

Multifunction power entry modules will rarely save money when compared only to the direct material cost of the components that they replace. In fact, the module will usually cost significantly more, mainly because the inclusion of additional functions makes the module more specialized, reduces the market appeal and production levels, and raises the unit tooling costs. Economic justification must be based on the issues described above.

Suggestions on Specifying Modules

Two issues need to be addressed when specifying power entry modules: the functions that must be included in the module and the mounting orientation. Power entry modules with seven basic functions are available from Panel Components Corporation. These functions are listed below with a brief description of the issues that will impact the specification decision.

AC power inlet: Current ratings are 6-15A and vary from model to model

Fuseholder: Models with either one or two fuseholders are available. Fuseholders accept either the 5 x 20mm international fuse *only* (especially true in the compact models) or are a combination style that accepts either the 5 x 20mm or the North American ¼" x 1¼" fuse by changing fuse carriers. (Medical manufacturers—see note on page 171.)

Voltage selector: Models with 2 or 4 position selectors are available to accommodate 100-120V (North America and Japan) and 220-240V (International).

Power switch: Switches in modules are normally rated at 250 VAC, 4-10A. A double-pole switch should be used on export products as overseas power mains and plugs are often unpolarized.

Circuit breaker: Eliminates possibility of replacing blown fuse with the wrong fuse; circuit breaker permits quick resetting after a fault condition.

Accessory outlet: Supplies power to an accessory or peripheral.

RFI filter: Filters that are integrated into power entry modules usually have limited insertion loss characteristics because the emphasis is on keeping size to a minimum which limits the size of inductors and capacitors.

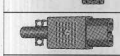
Designing to meet IEC 60950* (Business Machines)? Note change in requirements on RFI filters...

There is now a requirement that all x capacitors (connected between line and neutral) with values up to 0.33µF be able to withstand 3000VDC (an increase from 1500V). Almost all PCC filters and filtered modules have been phased in to meet this requirement; look for the statement "filter complies with IEC 60950*."

Horizontal or Vertical Mount Modules

Because space limitations are an important reason for the use of power entry modules,

Selection Chart for Power Inlets & Outlets

	INLETS & CONNECTORS, PAGE NO., RATING				CONTACTS	TEMP.		MOUNTING				
	Part No.	Page	N.A.	INT'L	style	65°C	120°C	inlet	Snap-in	Screw	PC Board	Cable outlet
	8301211	190	15A	10A	solder tabs	■		■		■		
	8301212	190	15A	10A	4.8mm QD	■		■		■		
	8301213	190	15A	10A	6.3mm QD	■		■		■		
	8301311	190	15A	10A	solder tabs	■		■	■			
	83013111	190	15A	10A	solder tabs	■		■	■			
	8301312	190	15A	10A	6.3mm QD	■		■	■			
	83013121	190	15A	10A	6.3mm QD	■		■	■			
	83011172	190	15A	10A	solder pins	■		■			■	
	83012330	191	10A	10A	solder tabs	■		■	■			
	83011500	186	2.5A	2.5A	solder tab	■		■		■		
	83011510	186	2.5A	2.5A	solder tab	■		■		■		
	83011520	185	2.5A	2.5A	solder tab	■		■		■		
	83011152	192	10A	10A	screw	■						■
	83011141	193	15A	10A	screw	■						■
	8301711	191	15A	10A	6.3mm QD		■	■		■		
	8943W60	193	15A	10A	screw		■					■
	8943LW60	194	15A	10A	screw		■					■
	83011340	194	20A	16A	6.3mm QD	■		■		■		
	83011380	194	21A	16A	screw	■						■
	83012500	192	15A	10A	screw	■						■
	83012520	192	15A	10A	screw	■						■
	83012700	193	15A	10A	screw		■					■
	83012720	193	15A	10A	screw		■					■

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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the vertical or horizontal orientation of the module may have an important bearing on the suitability of a module in a particular application. Rack-mounted video equipment, for example, is usually 0.5m wide but only 0.05m high. A horizontal-mounting module is essential in this application. Other types of equipment tend to be higher than they are wide, making a vertically oriented module the better choice.

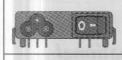
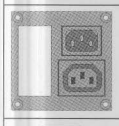
Power Modules for Medical Products

Power modules used on medical products face special requirements. In all European countries except the U.K., Ireland, Belgium, Switzerland, and Denmark, the power mains are unpolarized, so fusing both sides of the line is essential. Fusing both sides of the line on 115VAC circuits is not permitted in the U.S. or Canada (special rules apply for 230VAC circuits). Therefore, North American products should be single-fused; export versions, double fused.

Patient-connected medical equipment can be subjected to low-leakage current maximums, so filters with leakage currents in the 5µA range (250VAC) are desirable.

Selection Chart for Multifunction Power Entry Modules

Use this chart to compare the modules in this section by the rating, number of connections required, mounting style and number and type of functions included. The number of contacts is given to aid in estimating assembly costs.

POWER MODULE, PAGE NO. & RATING					CONTACTS		FUNCTIONS									FEATURES				MOUNTING		
	Part Number	Page	Current Rating 125V@250V N.A.	INT'L	No.	Style	Total No. Funct.	Power Inlet	Access Outlet	Class I 2.5A	Class II 2.5A	Fuse	Circuit Breaker	Voltage Selector	Switch	RFI Filter	5x20mm	1/4x1-1/4"	Double Fuse	Low Leak. RFI Filter	Snap-in	Screw	PC Board
	83511420	173	6-10A	10A	5	6.3mm	5	■				■		■	■	■	■	■				■	
	83511430	174	6A	6A	5	6.3mm	5	■				■		■	■	■	■		■	■		■	
	83511440	174	6A	6A	5	6.3mm	5	■				■		■	■	■		■		■		■	
	83511410	175	6-10A	6-10A	11	*	4	■				■		■	■		■	■				■	
	83510031	176	6A	4A	3	6.3mm	4	■				■			■	■	■				■		
	83510160	176	6A	10A	3	solder	3	■				■			■		■				■		
	83510071	177	6A	6A	7	6.3mm	4	■				■		■		■	■				■		
	83510170	177	6A	10A	7	solder	3	■				■		■			■				■		
	83016220	186	2.5A	2.5A	4	solder	2	■			■				■								■
	83016310	185	2.5A	2.5A	5	solder pins	2	■		■					■								■
	83110032	178	6A	10A	9	*	3	■				■			■		■	■				■	
	83110022	178	6A	10A	9	*	3	■				■			■		■	■	■			■	
	83110011	179	6A	10A	11	solder	3	■				■		■			■	■				■	
	83110150	180	15A	10A	10	6.3mm	3	■	■				■									■	
	83110160	180	15A	10A	7	6.3mm	2	■					■									■	
	83110121	182	10A	10A	3	solder	2	■				■					■				■		
	83110141	182	10A	10A	3	6.3mm	2	■				■					■				■		
	83110111	182	10A	10A	3	solder	2	■				■					■					■	
	83110131	182	10A	10A	3	6.3mm	2	■				■					■					■	
	83511400	184	10-15A	10A	7	solder pins	2	■	■														■
	83510312	187	1A	1A	3	6.3mm	2	■								■						■	
	83510352	187	3A	3A	3	6.3mm	2	■								■						■	
	83510412	187	6A	6A	3	6.3mm	2	■								■						■	
	83510442	187	10A	10A	3	6.3mm	2	■								■						■	
	83530592	188	6A	6A	3	6.3mm	2	■								■				■		■	
	83530600	189	5A	5A	5	6.3mm	1									■						■	
	83530610	189	10A	10A	5	6.3mm	1									■						■	
	83530620	189	20A	16A	5	6.3mm	1									■						■	

* solder tabs & 4.8QDs

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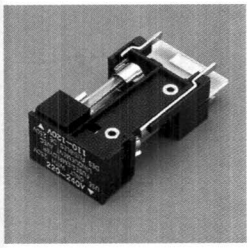
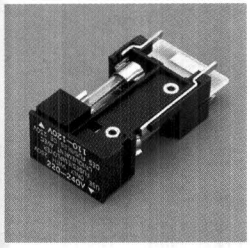
corresponding voltage range and triangle on drawer point. Load UL/CSA (¼ x 1¼") fuses into 110-120V drawer and 5x20mm international fuse into 220-240V drawer. When drawer is positioned for voltage selection, proper fuse will also be positioned into the circuit.

To select voltage, position fuse drawer so that inverted triangle (▼) printed on drawer next to desired voltage range points to triangle (▲) printed on lip of module.



For North American ¼x1¼" fuses: Lift sliding plastic cover to expose "third" clip. Slide fuse under cover so that center clip is on body of fuse.



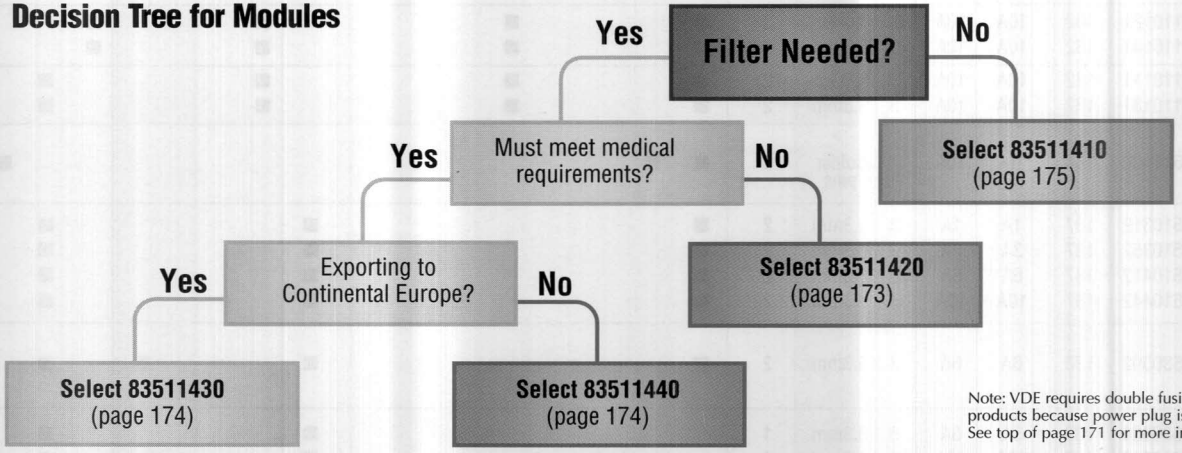
For International 5x20mm fuses: Clip under sliding plastic cover is not used.

Design Considerations: Comparison of Ratings, Filter Type, & Fuse

Part Number	Page Number	Filter	Fusing
83511420	173	Standard	Single
83511440	174	Low-Leakage	Single
83511430	174	Low-Leakage	Double
83511410	175	None	User configurable

Amperage ratings for these parts vary with approvals.

Decision Tree for Modules



Note: VDE requires double fusing for medical products because power plug is not polarized. See top of page 171 for more information.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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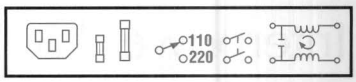
Interpower™ 5 Function Module



Offering the maximum number of functions in one unit, this power module combines:

1. IEC 60320* inlet
2. On-off double pole rocker switch
3. Fuse carrier for North American ¼" x 1¼" and International 5x20mm fuse (order fuses separately—see chart, page 210)
4. 2-position voltage selector: 110-120VAC for North America & Japan; 220-240VAC international
5. 10A RFI filter; insertion loss at right

FEATURES:

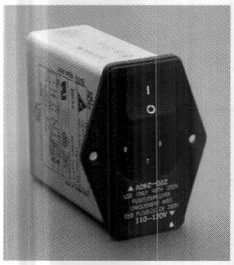
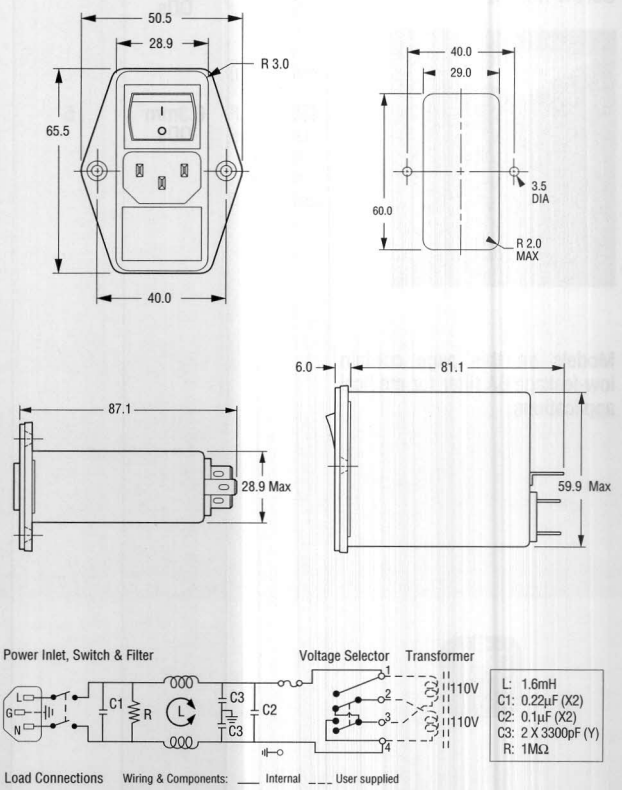
- Voltage selector, filter, and connections internally wired
- Easy to accommodate differences between international and North American input voltages and fusing
- Vertical mounting

(see previous page for assistance in specifying)

SPECIFICATIONS:

Body: UL 94V-0 rated polyamide-type thermoplastic
Maximum leakage current each:
Line to ground @ 115VAC, 60Hz: 0.25mA
Line to ground @ 250VAC, 50Hz: 0.45mA
Hipot rating (one minute):
Line to ground: 2250VDC
Line to line: 1450VDC
Operating Frequency: 50-60Hz
Rating: 115-250VAC, 65°C

83511420 Filter Performance	Min. insertion loss in dB (50 ohm system) Frequency—MHz							
	.05	.10	.15	.50	1.0	5.0	10	30
Common mode, L-G	10	15	15	25	30	40	40	30
Differential mode, L-L	2	5	3	35	45	40	40	30

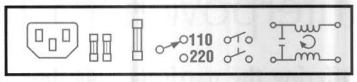
Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Screw mount 	83511420†	6.3mm solder QDs	5	10A/250 6A/250		

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

† filter complies with IEC 60950

Interpower™ 5 Function Medical Modules



For Class I medical applications, these power modules combine:

1. IEC 60320 inlet
2. On-off double pole rocker switch
3. Fuse carrier for North American ¼" x 1¼" and International 5x20mm fuse (order fuses separately—see chart, page 210)
4. 2-position voltage selector: 110-120VAC for North America & Japan; 220-240VAC international
5. 6A low leakage RFI filter; insertion loss at right

Note: ***Specify double fused models for European/international applications; single-fused model for U.S. & Canada—see top of page 171.***

FEATURES:

- Voltage selector, filter, and connections internally wired
- Easy to accommodate differences between international and North American input voltages and fusing
- Vertical mounting

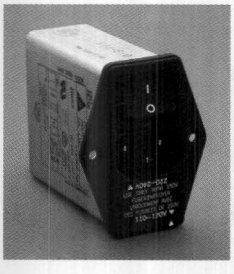
(See page 172 for demonstration of features)

SPECIFICATIONS:

Body: UL 94V-0 rated polyamide-type thermoplastic
Maximum leakage current each:
Line to ground @ 115VAC, 60Hz: 2.0µA
Line to ground @ 250VAC, 50Hz: 5.0µA
Hipot rating (one minute):
Line to ground: 2250VDC
Line to line: 1450VDC
Operating Frequency: 50-60Hz
Operating Temperature: -25° to 85°C
Current Rating: 115 & 250VAC, 50-60Hz—6A RMS Max.; 65°C

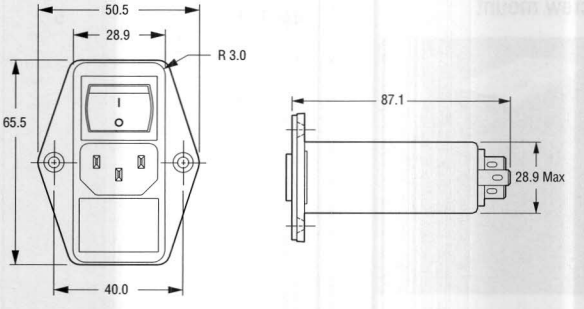
83511430 & 83511440 Filter Performance	Min. insertion loss in dB (50 ohm system) *Frequency—MHz*							
	.05	.10	.15	.50	1.0	5.0	10	30
Common mode, L-G	10	15	20	30	35	25	20	10
Differential mode, L-L	2	5	3	40	50	40	40	35

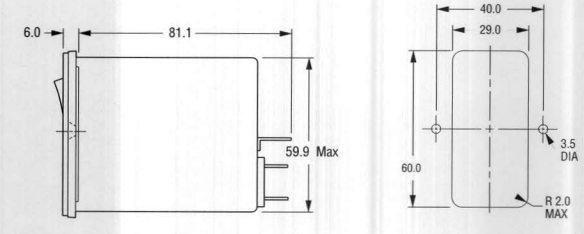
Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)
Screw mount	**83511430**† (dual fuse for int'l. medical applications)	6.3mm QDs	5	6A/250
	83511440† (single fuse for N.A. medical applications)	6.3mm QDs	5	6A/125



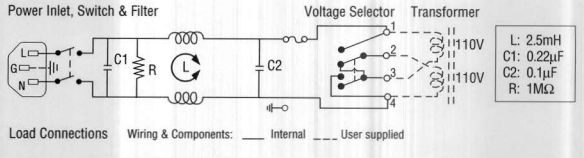
Models on this page contain low-leakage 6A filter for medical applications.

Drawings

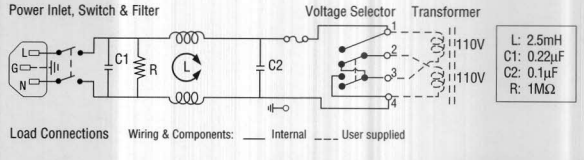




83511430 schematics



83511440 schematics



Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

† Filter complies with IEC 60950

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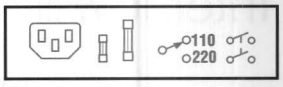
Interpower™ 4 Function Module



For Class I applications, this power module combines:

1. IEC 60320* inlet
2. On-off switch
3. Fuse carrier for North American ¼" x 1¼" and International 5x20mm fuse (order fuses separately—see chart on page 210)
4. 2-position voltage selector: 110-120VAC for North America & Japan; 220-240VAC international

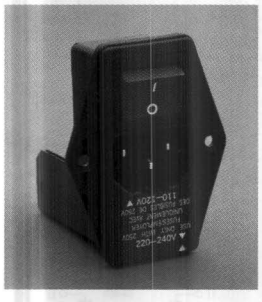
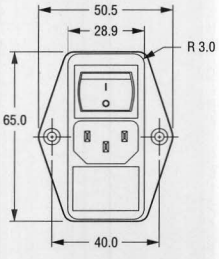
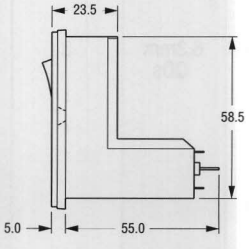
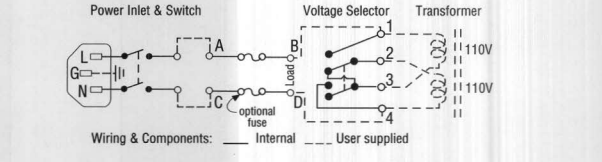
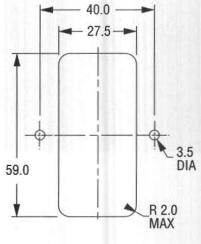
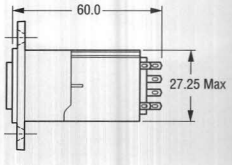
(See page 172 for guidance in specifying the modules on pages 173-175)

FEATURES:

- Four functions in one unit
- Accommodates North American ¼" x 1¼" and 5x20mm fuses
- Vertical mounting

SPECIFICATIONS:

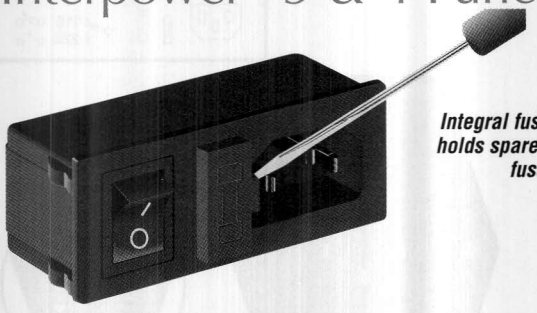
Body: UL 94V-O rated polyamide-type thermoplastic
Contacts: nickel-plated brass
Hipot rating (one minute): L – G & L – L, 1000VAC
Minimum insulation resistance at 500VDC: 10 MΩ
Dielectric strength (1 min.): 2000VAC between pins
Operating Frequency: 50-60Hz
Rating: 115-250VAC, 65°C
Switch: Double-pole power switch. 10,000 cycles electrical lifetime. Maximum in-rush current: 65A

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Screw mount  (no filter)	**83511410**	solder tabs, 4.8QDS	11	6A/250 10A/250	  	 

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Interpower™ 3 & 4 Function Modules



Integral fuse carrier holds spare 5x20mm fuse

For Class I applications, these power modules combine:

1. IEC 60320* inlet
2. Integral 5 x 20mm fuseholder (fuses available separately)
3. Integral double pole rocker switch
4. Model 83510031, 6A RFI filter

FEATURES:

- Compact; minimum depth behind the panel
- Minimum number of connections required
- Horizontal/snap-in mounting

SPECIFICATIONS:

Materials: Body, UL 94V-0 rated polyamide-type thermoplastic; contacts, nickel-plated brass. Insulation resistance: 10MΩ.

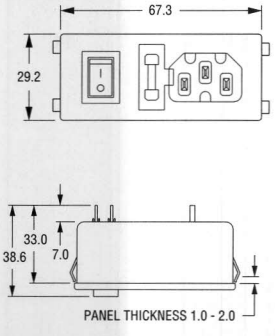
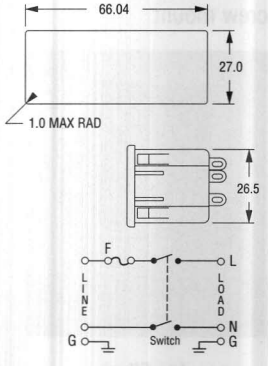
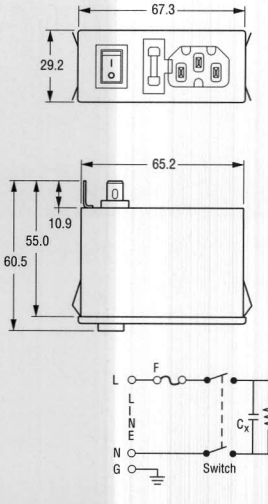
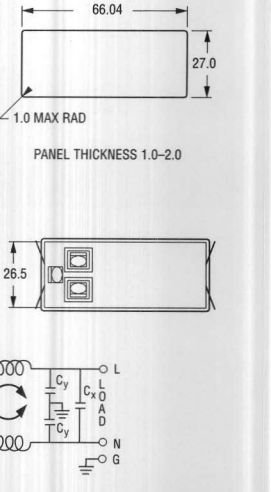
Model 83510160:

Hipot rating (one minute): L – G & L – L, 2000VAC
Operating Temp Range: 65°C
Operating Frequency: 50-60Hz

Model 83510031 with filter:

Max. leakage current: L – G @ 115VAC, 60Hz: 0.25mA;
L – G @ 250VAC, 50Hz: 0.45mA
Hipot rating (one minute): L – G 2250VDC; L – L: 1450VDC
Operating Temp Range: -25° to 85°C

83510031 Filter Performance	Min. insertion loss in dB (50 ohm system) *Frequency—MHz*							
	.05	.10	.15	.50	1.0	5.0	10	30
Common mode, L-G		15	16	25	30	40	45	40
Differential mode, L-L		6	6	30	48	40	40	40

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Snap-in mount—no filter	**83510160**	solder tabs	3	10A/250 6A/250		
Snap-in mount—with filter	**83510031**†	6.3mm QDs	3	4A/250 4A/250 6A/125		

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

† Filter complies with IEC 60950

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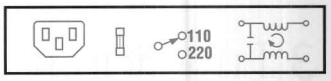
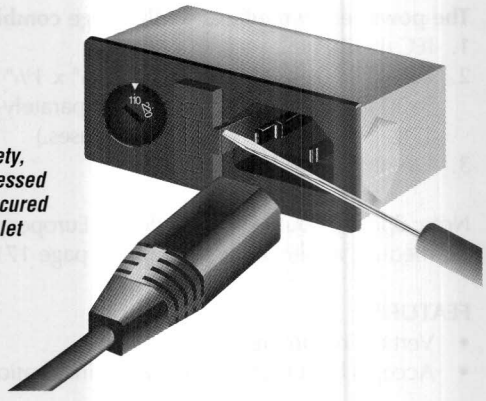
Interpower™ 3 & 4 Function Modules



SPECIFICATIONS:
Materials: Body, UL 94V-0 rated polyamide-type thermoplastic; contacts, nickel-plated brass. Insulation resistance: 10MΩ.

Model 83510170:
Hipot rating (one minute): L – G & L – L, 2000VAC
Operating Temp Range: 65°C
Operating Frequency: 50-60Hz

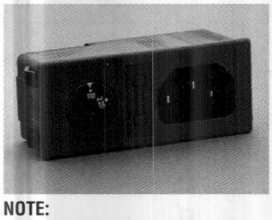
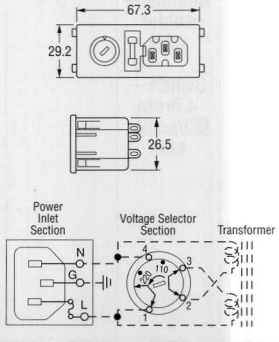
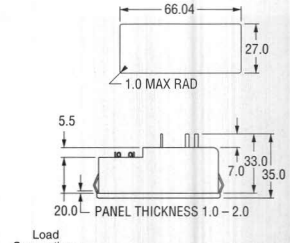
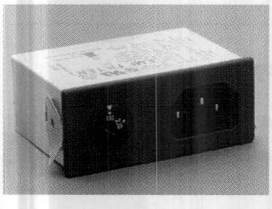
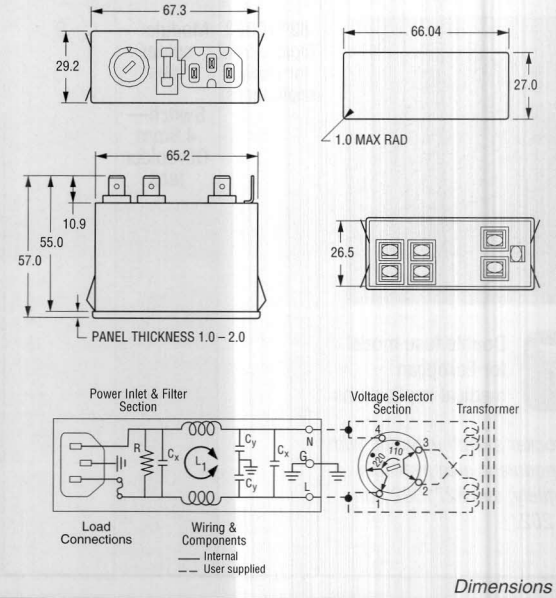
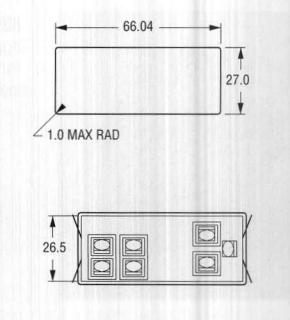
Model 83510071 with filter:
Max. leakage current: L – G @ 115VAC, 60Hz: 0.25mA;
L – G @ 250VAC, 50Hz: 0.45mA
Hipot rating (one minute): L – G 2250VDC; L – L: 1450VDC
Operating Temp Range: -25 to 85°
Operating Frequency: 50-60Hz



For operator safety, fuse cannot be accessed when cordset is secured in IEC 60320* inlet

83510071 Filter Performance	Min. insertion loss in dB (50 ohm system) Frequency—MHz							
	.05	.10	.15	.50	1.0	5.0	10	30
Common mode, L-G		15	16	25	30	42	45	40
Differential mode, L-L		6	6	30	48	40	40	40

The power modules on this page combine:
1. IEC 60320* inlet
2. Integral 5 x 20mm fuseholder (fuses available separately)
3. 2-position voltage selector (N. A. 110VAC; Int'l. 220VAC)
4. Model 83510071, 6A RFI filter

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Snap mount  **NOTE: Voltage selector is not designed to be switched while power is applied. Selection must be made before connecting the unit to the power mains.**	**83510170**	solder tabs	7	10A/250 6A/250		
Snap mount—with filter  **NOTE: Voltage selector is not designed to be switched while power is applied. Selection must be made before connecting the unit to the power mains.**	**83510071†**	6.3mm QDs	7	6A/250		

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

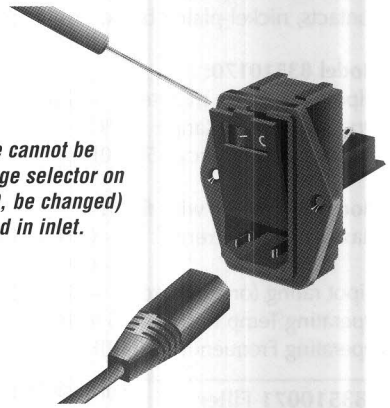
† Filter complies with IEC 60950

3 Function Modules

The power entry modules on this page combines:

1. IEC 60320* inlet
2. Fuse carrier for North American ¼" x 1¼" and international 5x20mm fuses. Specify carriers separately—see top of page 179. (See chart on page 210 for fuses.)
3. On-off double pole rocker switch

Note: Specify double fuse model for European/international medical applications—see top of page 171.



For operator safety, fuse cannot be accessed (nor can the voltage selector on model 83110011, page 179, be changed) when cordset is secured in inlet.

FEATURES:

- Vertical mounting
- Accepts both North American & international fuses

SPECIFICATIONS FOR MODULES ON PAGES 178-179:

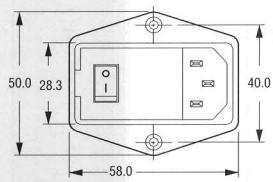
Materials: Body is UL 94V-0 polyamide-type thermoplastic; contacts are nickel-plated brass

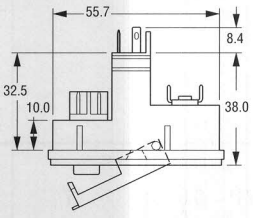
Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)
Screw mount	**83110032** (single fuse)	Module—solder tabs Switch—4.8mm QD/solder tabs	9	10A/250 6A/250
Screw mount	**83110022** (double fuse, for medical applications)	Module—solder tabs Switch—4.8mm QD/solder tabs	9	10A/250 6A/250

Double fuse model for European medical applications

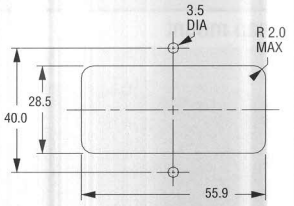
The rocker switch included with this module is also available separately; see 82710020 on page 202.

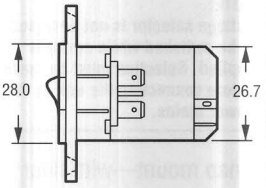
Drawings

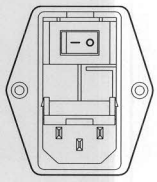




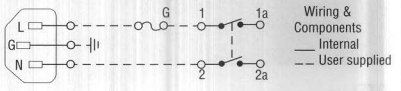
Mounting

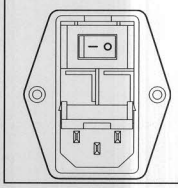




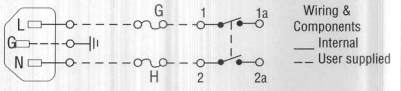


83110032—single fuse model





83110022—double fuse model



Note: Modules above must be mounted so that the "one" denoting "on" is in a vertical position to comply with IEC 60417 standards.

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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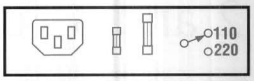
3 Function Module



The power entry module on this page combines:

1. IEC 60320* inlet
2. Fuse carrier for North American ¼" x 1¼" and international 5x20mm fuses. (Order fuse carriers and fuses separately.)
3. 4-position voltage selector: 100, 120, 220, 240VAC

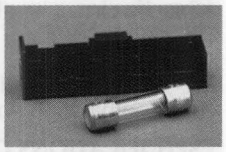
FEATURES:

- Vertical mounting
- Accepts both North American & international fuses

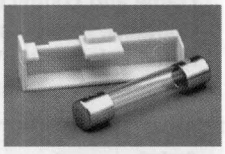
Rotate selection wheel so that the correct voltage—100, 120, 220, or 240V—appears in the window when the access door is closed.

Fuse carriers

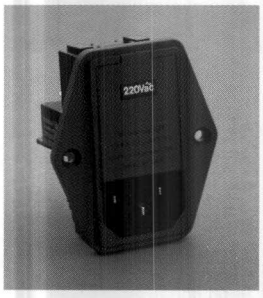
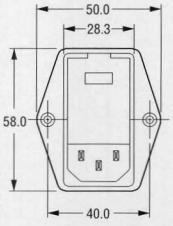
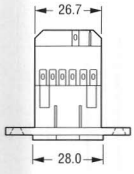
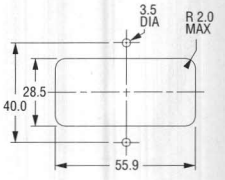
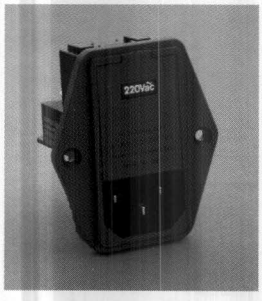
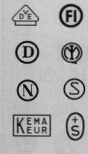
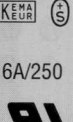
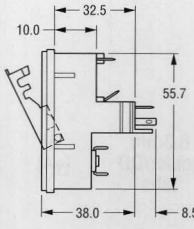
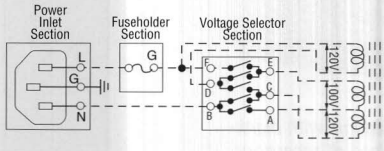
Specify and order separately to accommodate different fuse sizes. Fuse Carriers for modules 83110032, 83110022, & 83110011 on pages 178-179 only.



83110050:
Carrier for International 5x20mm fuse.
Color: black



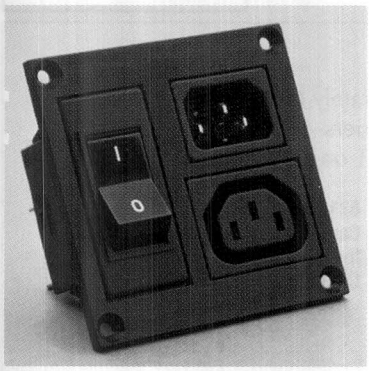
83110040:
Carrier for North American ¼" x 1¼" fuse.
Color: gray

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Screw mount  Voltage selection wheel (included with module)	**83110011**	Solder tabs	11	10A/250 6A/250	 	
Screw mount  Voltage selection wheel (included with module)	**83110071**	Solder tabs	13	10A/250  6A/250 	 	**Voltage Selector Combinations** E-F, E-D, C-D, C-B, A-B 100 VAC: E-F, C-B 120 VAC: E-D, C-B 220 VAC: C-D, A-B 240 VAC: E-D, C-D, A-B Rotate the voltage selection wheel so the correct voltage appears in the window when the fuse access door is closed. The switches indicated in the chart above are closed by cams on the selection wheel.

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

2 and 3 Function Modules



Module with Circuit Breaker in place

For Class I applications, this module combines:

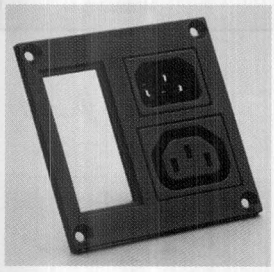
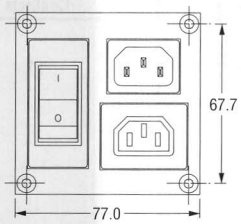
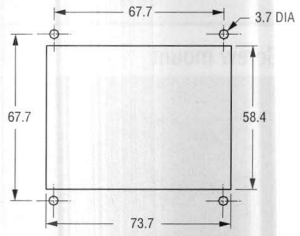
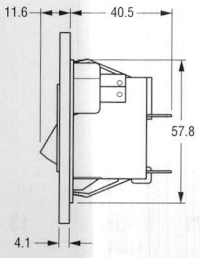
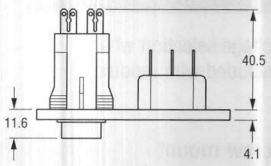
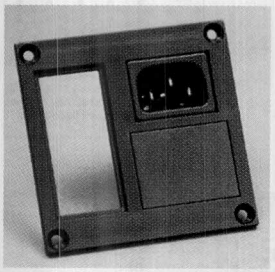
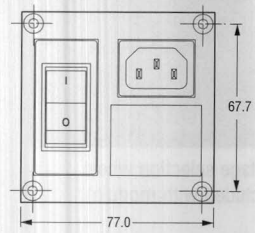
1. IEC 60320* inlet
2. "Reverse" IEC 60320* accessory power outlet
3. Circuit breaker (specify separately; see page 181)

Basic module (83110150) is comprised of inlet, accessory outlet and frame.
Model 83110160 has a blanking plate in place of the accessory outlet.
Specify circuit breaker separately—see opposite page.

FEATURES:

- Circuit breaker provides convenient reset to get your equipment back on line quickly.
- Combination on/off power switch and circuit breaker

SPECIFICATIONS ON FRAME & CONNECTORS
Frame and connectors: thermoplastic polyamide
Contacts: Nickel-plated brass
Rated voltage: 250VAC
Maximum temperature: 65°C

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Screw mount  ***83110150:*** *Module with IEC 60320* inlet and accessory outlet; specify circuit breaker separately.*	**83110150**	6.3mm solder/QD tabs	6 (+4)	**INLET—** 10A/250 15A/250†		
				OUTLET— 10A/250 15A/250†		
Screw mount  ***83110160:*** *Module with blanking plate instead of accessory outlet*	**83110160**	6.3mm solder/QD tabs	3 (+4)	**INLET—** 10A/250 15A/250†	***Model 83110160*** ***(Drawing views are with circuit breaker in place)***	

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

† Call regarding availability of 15A circuit breaker

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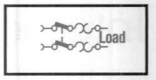
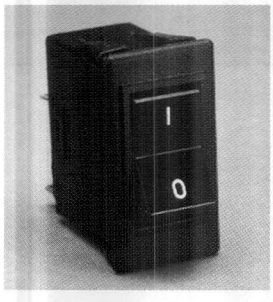
TOLL-FREE (U.S./Can./P.R./V.I.)
Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360

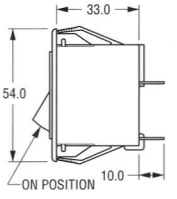
Circuit Breakers—order separately:

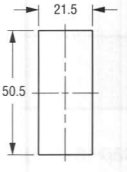


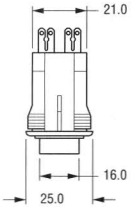
SPECIFICATIONS:

2-pole with thermal sensing. Specify part number and amperage rating.
Trip free—cannot be held closed against an overload; rocker will travel to OFF position.
Maximum voltage: 250VAC
Maximum interrupting capacity: 10x rated current up to 2A; 300A for models 4A and above
Life: 25,000 cycles at rated current
Dielectric strength: 2000VAC
Insulation resistance: 100 megohms
Operating temperature range: -30° to 60°C
Shock resistance: 30 g (IEC 60068-2-27*, Ea)
Vibration resistance: 8 g (IEC 60068-2-6*, Fc/A)
Humidity: 95% at 40°C (IEC 60068-2-30*, C)

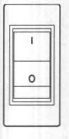
	Part Number	Contact Style	Current Rating (250VAC)	No. of contacts	VDE Interrupt. cap.	Internal resistance (Ω)	Approvals
Snap-in mount	**82910010**	6.3mm QD/solder tabs	1A	4	10A	1.8	
	**82910020**	6.3mm QD/solder tabs	2A	4	20A	0.54	
	82910030	6.3mm QD/solder tabs	4A	4	300A	0.087	
	82910040	6.3mm QD/solder tabs	6A	4	300A	0.043	
	82910050	6.3mm QD/solder tabs	8A	4	300A	0.033	
	82910060	6.3mm QD/solder tabs	10A	4	300A	< 0.04	
	82910080	6.3mm QD/solder tabs	15A	4	300A	< 0.04	





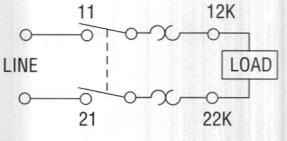


For 0.1 to 6.35mm panel thickness



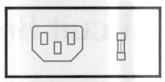
Dimensions in mm

Trip current is 140% of rated current. Tripping time in seconds at (23°C) at various overload levels:							
OVERLOAD LEVEL:	100%	200%	300%	400%	500%	600%	1000%
1-2A ratings: (curve 382.280/2)	No trip	10-60 sec.	3.5-15 sec.	2-7 sec.	1.5-5 sec.	1-3.5 sec.	0.8-2 sec.
4-10A ratings: (curve 382.280/3)	No trip	8-40 sec.	3-10 sec.	1.5-5 sec.	1-3 sec.	0.6-2 sec.	0.2-1 sec.



* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Interpower™ 2 Function Modules



FEATURES:

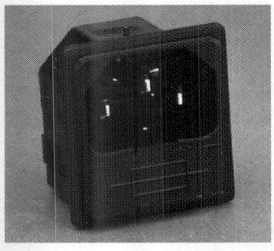
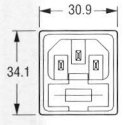
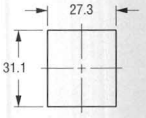
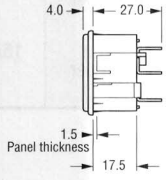
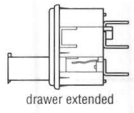
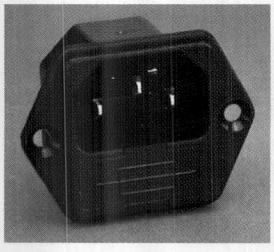
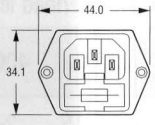
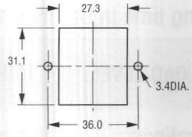
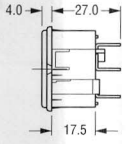
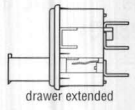
- Fuse carrier has space for spare fuse
- Snap-in or screw mounting
- Compact; minimum depth behind the panel
- International 5 x 20mm fuse only

For Class I applications, the power entry modules on this page combine:

1. IEC 60320* inlet for Class I applications
2. Integral carrier for International 5x20mm fuse (order fuses separately—see chart on page 210)

SPECIFICATIONS:

Rating: 10A/250VAC, 65°C
Materials: Insulator molded from UL 94V-0 polyamide-type thermoplastic; nickel-plated brass solder contacts.
Operating Temperature: -40° to 70°C
Contact Resistance: <10mΩ
Insulation Resistance: >10^3 mΩ

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Snap-in mount  UL 94V-0 flammability rating	**83110121**	solder tabs	3	10A		
	83110141	6.3mm QDs	3			
Screw mount  UL 94V-0 flammability rating	**83110111**	solder tabs	3	10A		
	83110131	6.3mm QDs	3			

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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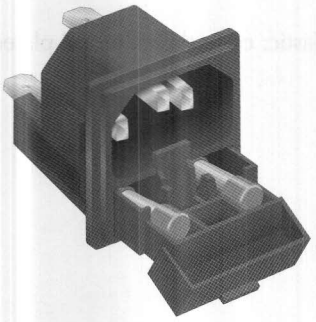
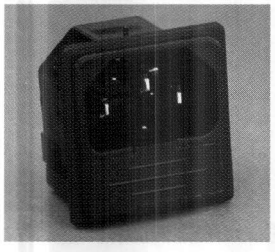
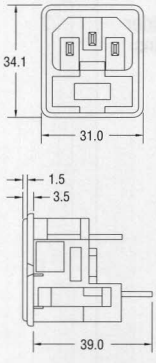
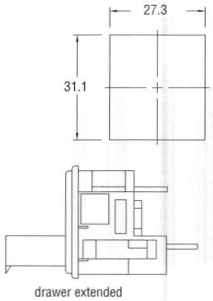
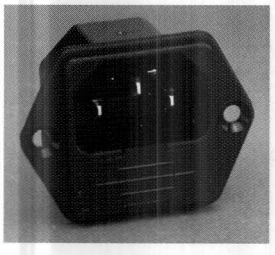
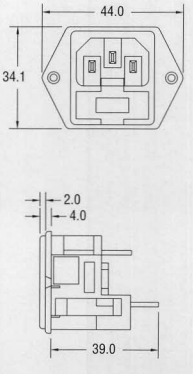
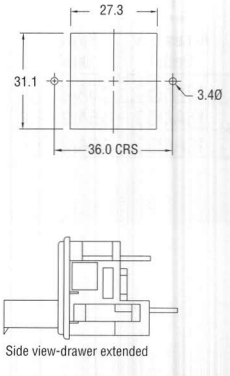
Interpower™ 2 Function Modules

FEATURES:
- Snap-in or screw mounting
- Compact; minimum depth behind the panel
- International 5 x 20mm fuse only



For Class I applications, the power entry modules on this page combine:
1. IEC 60320* inlet for Class I applications
2. Integral carrier for International 5x20mm fuses (order fuses separately—see chart on page 210)

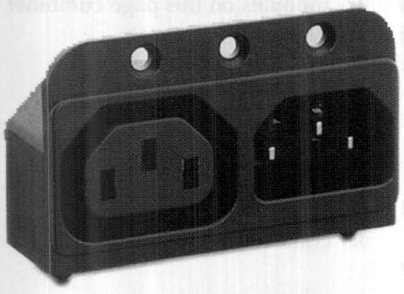
SPECIFICATIONS:
Rating: 10A/250VAC, 65°C
Materials: Insulator molded from UL 94V-0 polyamide-type thermoplastic; nickel-plated brass solder contacts.
Operating Temperature: -20° to 70°C
Contact Resistance: <10mΩ
Insulation Resistance: $>10^3$mΩ

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Snap-in mount  UL 94V-0 flammability rating	**83110180**	6.3mm QDs	3	10A		
Screw mount  UL 94V-0 flammability rating	**83110170**	6.3mm QDs	3	10A		

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Interpower™ 2 Function Modules



For Class I applications, this printed circuit board mounting power module combines:

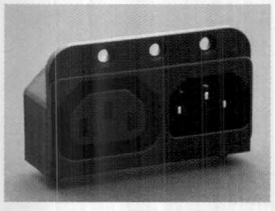
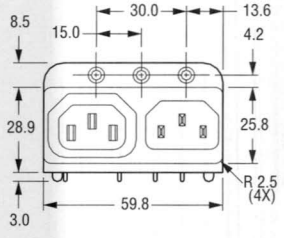
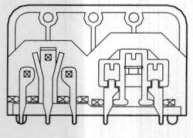
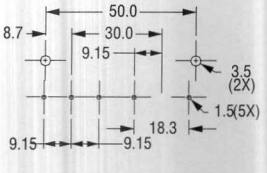
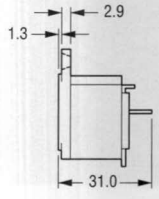
1. IEC 60320* inlet
2. Accessory outlet

SPECIFICATIONS:

Rating: 10-15A/250, 65°C (see chart at lower left)
Materials: Body is UL 94V-0 polyamide-type thermoplastic; contacts are nickel-plated brass for soldering on printed circuit board
Minimum insulation resistance at 500VDC: 10MΩ
Dielectric strength (1 min.): 2000VAC between pins

FEATURES:

- PC board mounting
- Screw mounting

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Screw/pc-board mount 	**83511400**	solder pins	7	10-15A/ 250 (see chart, lower left)	  	

Current ratings:

Agency	Accessory Outlet	Power Inlet
UL	10A/250	15A/250
CSA	15A/250	15A/250
VDE	10A/250	10A/250

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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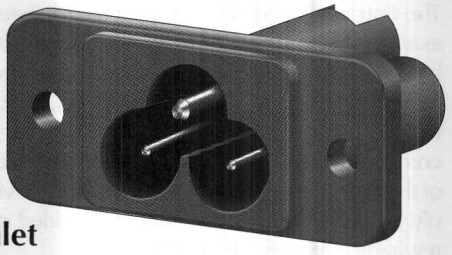
IEC 60320* Power Connections rated at 2.5A

65°C

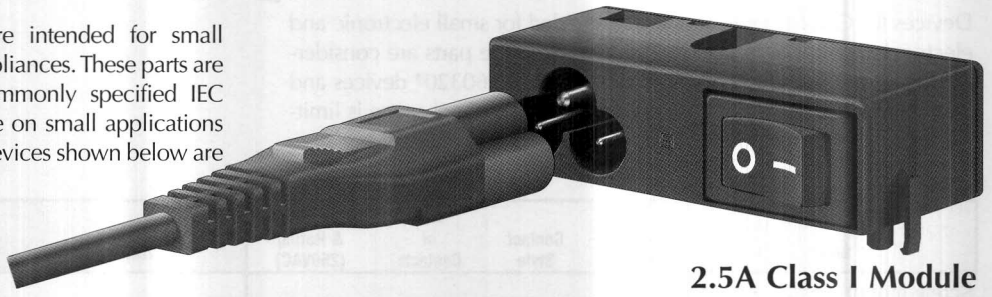
International Class I Devices

The IEC 60320* C5 connectors and C6 inlets and modules have three-pins, which include a ground contact. Originally intended for use on sewing machines, this coupler is now finding applications on laptop computers. This presence of a ground at the equipment allows designers to incorporate a high performance radio frequency (RFI) interference filter into the inlet. All C5 connectors must be molded onto cordage; rewirable versions are not permitted.

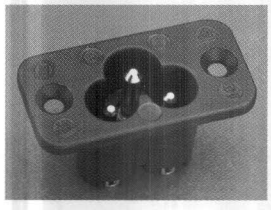
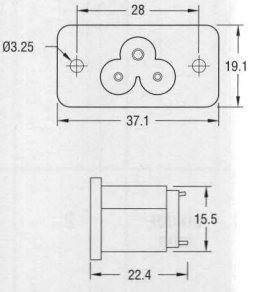
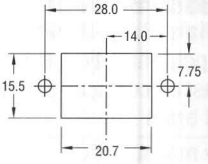
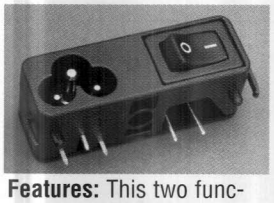
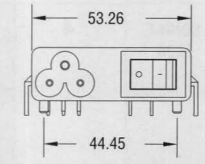
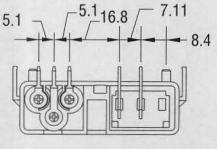
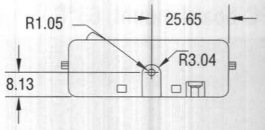
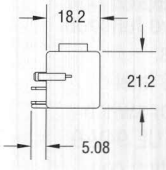


2.5A Class I Inlet

Devices for Class I applications are intended for small grounded electronic and electrical appliances. These parts are considerably smaller than more commonly specified IEC 60320* devices and will be welcome on small applications in which panel space is limited. The devices shown below are rated at 2.5A/250VAC.



2.5A Class I Module

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Screw mount, 65°C  **Materials:** Body, UL 94V-2 rated thermoplastic; pins and contacts, nickel-plated copper alloy	**83011520**	solder tabs	3	2.5A		
PC-board mount, 65°C  **Features:** This two function module combines: 1. IEC 60320* inlet 2. One pole rocker switch **Materials:** Body, UL 94V-0 rated thermoplastic; contacts, plated brass	**83016310**	solder tabs	5	2.5A	 	 

Note: According to IEC 60417*, this module must be mounted so the switch markings are in a vertical position.

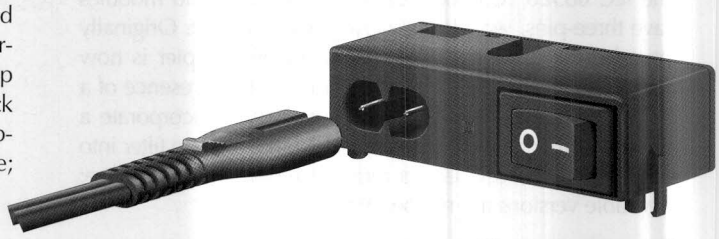
Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

International Class II Devices

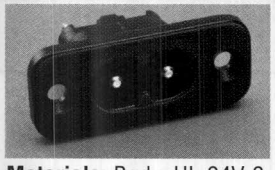
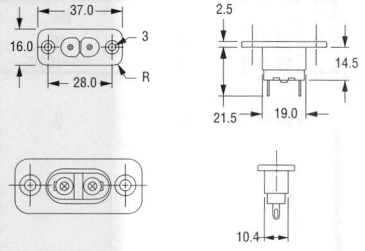
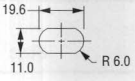
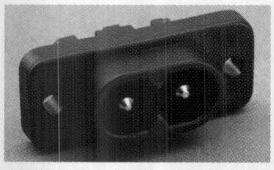
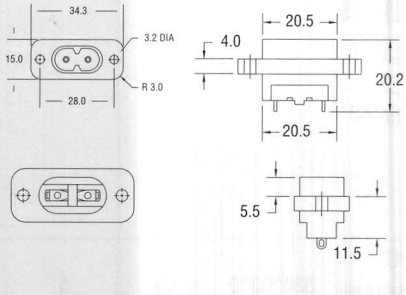
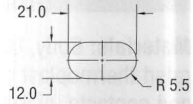
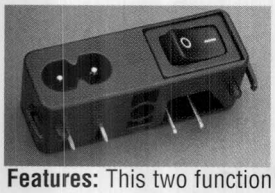
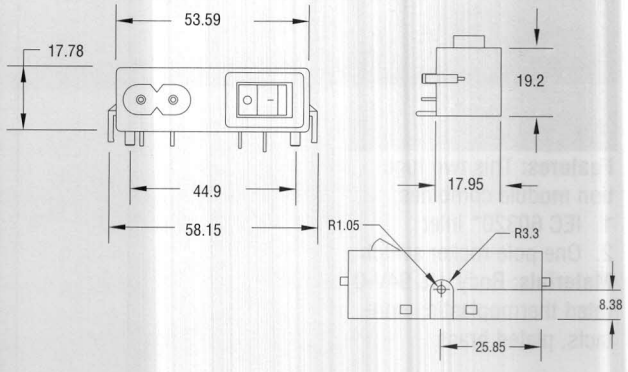
65°C

The coupler pair described in standard sheets C7 and C8 is another example of an IEC 60320* configuration with new life. This coupler has no ground contact. C7 and C8 couplers were originally developed for use in devices such as electric razors, radios, and other home entertainment appliances. Now this coupler pair is finding use on laptop computers. In some cases, the power connection is made at the back of the laptop itself. In other cases, it is made via a detached power supply. Also, C7 connectors must be molded onto the power cordage; rewirable versions are not allowed.



2.5A Class II Module

Devices for Class II applications are intended for small electronic and electrical appliances that are not grounded. These parts are considerably smaller than more commonly specified IEC 60320* devices and will be welcome on small applications in which panel space is limited. The devices shown below are rated at 2.5A/250VAC.

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Screw mount, 65°C  **Materials:** Body, UL 94V-2 rated polyamide-type thermoplastic; contacts, nickel-plated brass	**83011500**	solder tabs	2	2.5A		
Screw mount, 65°C  **Materials:** Body, UL 94V-2 rated polyamide-type thermoplastic; contacts, nickel-plated brass	**83011510**	solder tabs	2	2.5A		
PC-board mount, 65°C  **Features:** This two function module combines: 1. IEC 60320* C6 inlet 2. One-pole rocker switch **Materials:** Body, UL 94V-0 rated thermoplastic; contacts, nickel-plated brass	**83016220**	solder tabs	4	2.5A		

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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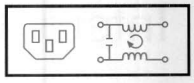
Interpower™ 2 Function Modules



For Class I applications, these modules include an IEC 60320* power inlet and a general purpose filter to provide RFI suppression of line to line ground noise. Models are available in 1, 3, 6, and 10A ratings. Meets IEC 60950* specifications for electrical strength and resistance to fire. For insertion loss data, see the chart at bottom of page.

Materials: Corrosion-proof metal can; UL 94V-0 thermoplastic inlet

SPECIFICATIONS:

Operating temperature range: -25° to 85°C

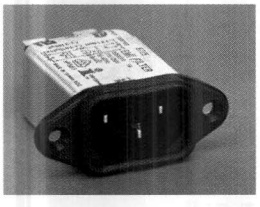
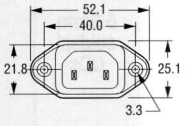
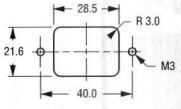
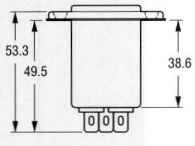
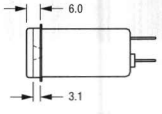
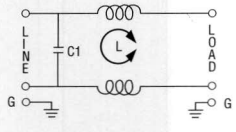
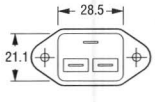
Maximum Leakage Current:

line to ground @ 115VAC, 60Hz: 0.25mA

line to ground @ 250VAC: 50Hz: 0.45mA

Hipot Rating: line to ground—2250 VDC (1 min.)

line to line—1450 VDC (1 min.)

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Screw mount 	**83510312**	6.3mm solder/ QDs	3	1A		
	83510352	6.3mm solder/ QDs	3	3A		
	83510412	6.3mm solder/ QDs	3	6A		
	83510442	6.3mm solder/ QDs	3	10A		

Dimensions in mm

INSERTION LOSS DATA ON MODELS ABOVE

Part Number	Current Rating (115/250 VAC)	C1 Capacitor	C2 Capacitors	Inductor	Minimum Common mode insertion loss (L-G) (dB in 50Ω system) Frequency–MHz								Min. Differential mode insertion loss (L-L) (dB in 50Ω system) Frequency–MHz							
					.05	.10	.15	.50	1.0	5.0	10	30	.05	.10	.15	.50	1.0	5.0	10	30
83510312	1A	0.033 µF (X2)	2 X 2200 pF (Y)	2 X 5 mH	18	25	28	40	45	45	45	45		0	2	10	20	40	42	40
83510352	3A	0.033 µF (X2)	2 X 2200 pF (Y)	2 X 1.8 mH	10	15	22	30	35	45	45	45		0	2	5	14	38	40	40
83510412	6A	0.033 µF (X2)	2 X 2200 pF (Y)	2 X 0.6 mH	4	8	12	20	25	40	45	45		0	2	5	10	35	38	40
83510442	10A	0.033 µF (X2)	2 X 2200 pF (Y)	2 X 0.18 mH	0	2	4	10	15	30	38	45		0	2	5	10	25	35	40

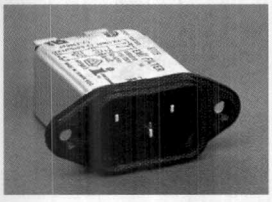
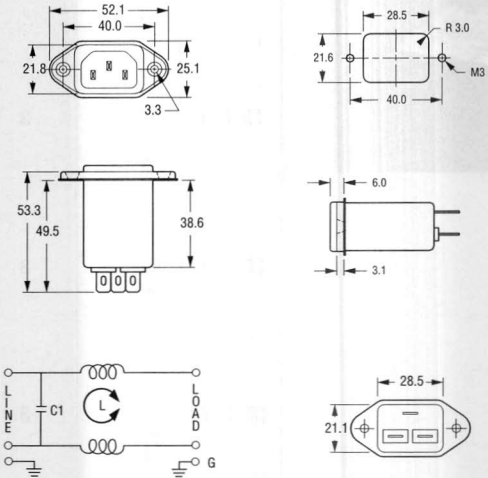
* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Interpower™ 2 Function Medical Module

For Class I medical applications, this module includes an IEC 60320* power inlet and a low-leakage 6A filter. For insertion loss data, see chart at bottom of page.

Materials: Corrosion-proof metal can; UL 94V-O thermoplastic inlet

SPECIFICATIONS:
Operating temperature range: -25° to 85°C
Maximum Leakage Current:
line to ground @ 115VAC, 60Hz: 2μA
line to ground @ 250VAC: 50Hz: 5μA
Hipot Rating: line to ground—2250 VDC (1 min.)
line to line—1450 VDC (1 min.)

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (125/250VAC)	Drawings	Mounting
Screw mount 	**83530592**	6.3mm solder/ QDs	3	6A		

Dimensions in mm

INSERTION LOSS DATA ON 83530592 ABOVE

Part Number	Current Rating (115/250 VAC)	C1 Capacitor	Y Capacitors	Inductor	Minimum Common mode insertion loss (L-G) (dB in 50Ω system) Frequency–MHz								Min. Differential mode insertion loss (L-L) (dB in 50Ω system) Frequency–MHz							
					.05	.10	.15	.50	1.0	5.0	10	30	.05	.10	.15	.50	1.0	5.0	10	30
83530592	6A	0.033 μF (X2)	(None)	2 X 0.6mH	4	6	8	20	24	26	20	15								

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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Call toll-free: (800) 662-2290
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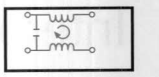
Interpower™ Block Style RFI Filters



For Class I applications, these general purpose filters provide RFI suppression of line to line ground noise. The models below are compact; available in 5, 10, and 20A ratings. Meets requirements for IEC 60950*. For insertion loss data, see chart at bottom of page.

Materials: Corrosion-proof metal can.

SPECIFICATIONS:

Operating temperature range: -25° to 85°C

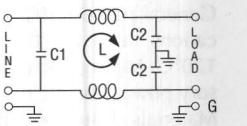
Maximum Leakage Current:

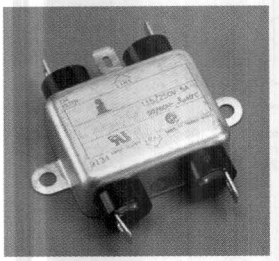
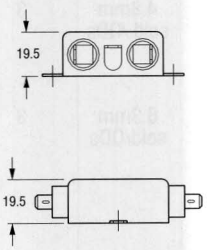
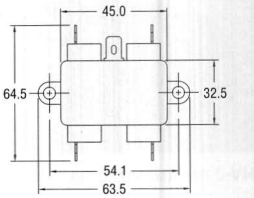
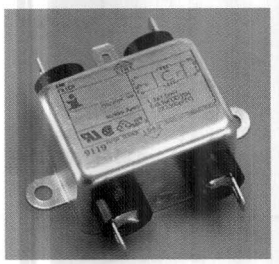
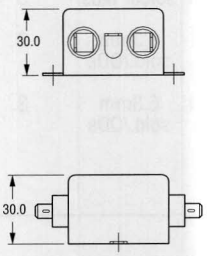
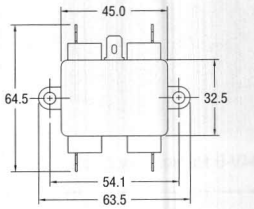
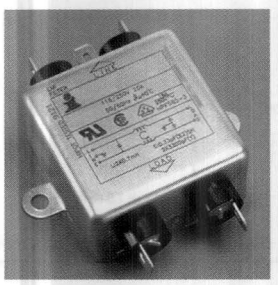
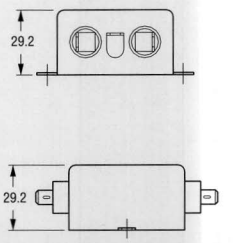
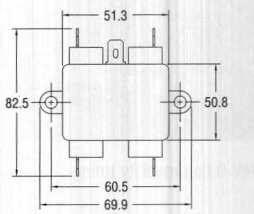
line to ground @ 115VAC, 60Hz: 0.25mA

line to ground @ 250VAC: 50Hz: 0.45mA

Hipot Rating: line to ground—2250 VDC (1 min.)

line to line—1450 VDC (1 min.)



Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
	**83530600**	6.3mm solder/ QDs	5	5A		
	**83530610**	6.3mm solder/ QDs	5	10A		
	**83530620**	6.3mm solder/ QDs	5	16A (20A at 115VAC)		

Dimensions in mm

INSERTION LOSS DATA ON MODELS ABOVE

Part Number	Current Rating 115 VAC	Current Rating 250 VAC	C1 Capacitor	C2 Capacitors	Inductor	Minimum Common mode insertion loss (L-G) (dB in 50Ω system) Frequency–MHz .05	.10	.15	.50	1.0	5.0	10	30	Min. Differential mode insertion loss (L-L) (dB in 50Ω system) Frequency–MHz .05	.10	.15	.50	1.0	5.0	10	30
83530600	5A	5A	0.1 µF (X2)	2 X 3300 pF (Y)	2 X 2.9 mH			15	30	38	45	45	45			6	15	20	40	45	45
83530610	10A	10A	0.1 µF (X2)	2 X 3300 pF (Y)	2 X 1.5 mH			20	30	35	50	50	45			6	15	20	44	45	45
83530620	20A	16A	0.33 µF (X2)	2 X 3300 pF (Y)	2 X 0.7 mH			13	20	25	40	45	45			15	24	28	45	45	45

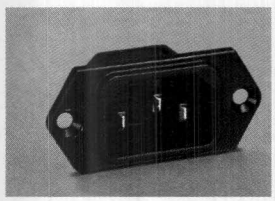
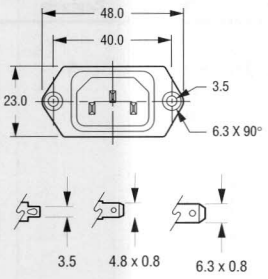
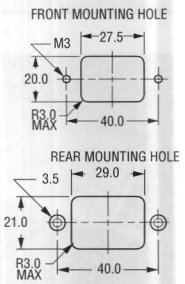
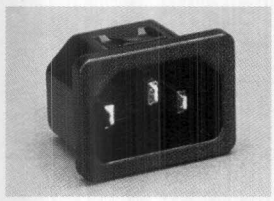
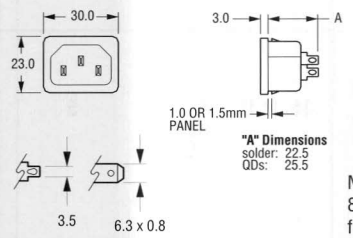
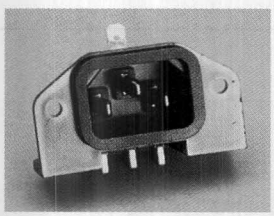
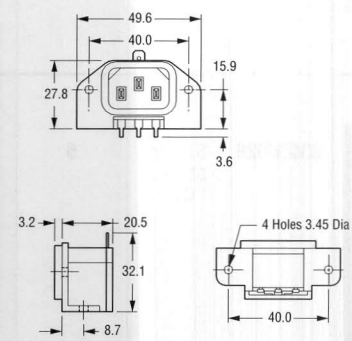
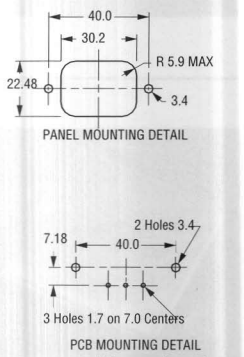
* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Interpower™ IEC 60320* Power Inlets

65°C 120°C

General purpose IEC 60320* sheet C14 power inlets for Class I applications rated at 10A international, 15A North American, 65°C or 120°C. Mating cable connectors are shown on page 192-193; accessory power connectors are on pages 199.
Materials: Insulator—polyamide-type thermoplastic. Brass, tin plated contacts.

Cordset Connector locks—The lock ensures a connection and reduces the possibility of an accidental disconnection of the cordset from the power inlet. They are available for use with most cordset models. Connector locks can be used with inlet models 8301211, 8301212, and 8301213 only. See page 70 for more information.

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
Screw mount, 65°C  UL 94V-0 flammability rating	**8301211**	solder tabs	3	10A		
	8301212	4.8mm sold./QDs	3			
	8301213	6.3mm sold/QDs	3	15A		
Snap-in mount, 65°C  UL 94V-0 flammability rating	**8301311**	solder tabs	3	10A	 Note: Panel size for 8301311 and 8301312 are 1.5mm. Panel size for 83013111 and 83013121 are 1.0mm.
	83013111	solder tabs	3			
	8301312	6.3mm sold./QDs	3			
	83013121	6.3mm sold./QDs	3	15A		
Angled PC-board mount, 65°C  UL 94V-0 flammability rating	**83011172**	solder pins	4	10A 15A		

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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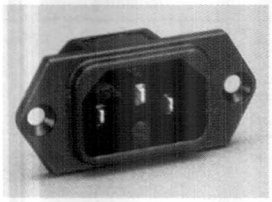
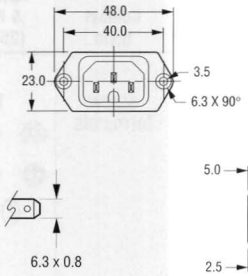
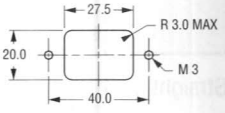
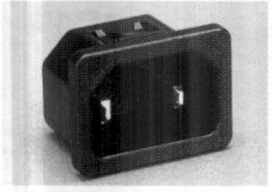
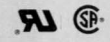
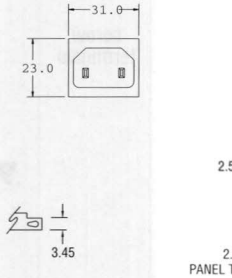
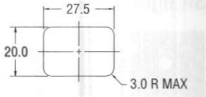
IEC 60320* Power Connections rated at 10A cont.

Style	Part Number	Contact Style	No. of Contacts	Approvals & Rating (250VAC)	Drawings	Mounting
"Hot" 120°C-screw mount  UL 94V-2 flammability rating	**8301711**	6.3mm solder/QDs	3	10A 15A		
Snap-in mount, 65°C (Class II)  UL 94V-0 flammability rating	**83012330**	solder tabs	2	10A 15A 		

Dimensions in mm

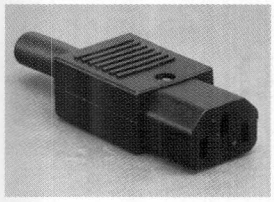
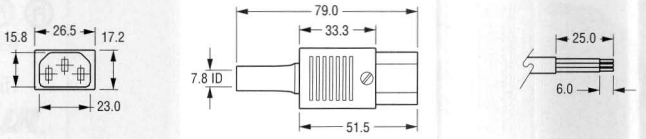
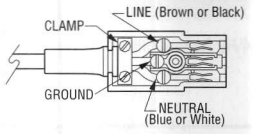
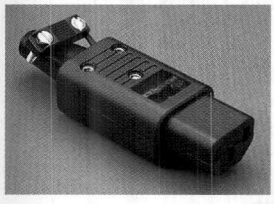
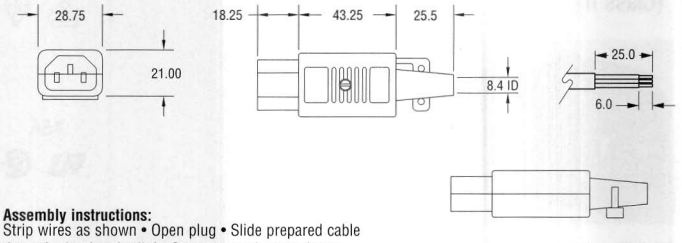
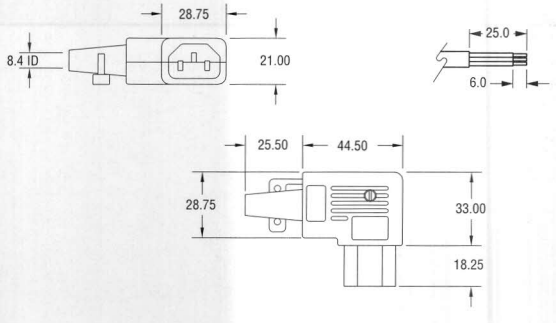
* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

IEC 60320* Rewirable Cable Connectors

65°C 120°C

These IEC 60320* Sheet C13 cable connectors mate with inlets on previous pages. Cable assembly services available; call for more information.

Materials: insulator—Polyamide-type thermoplastic; contacts are brass or nickel-plated brass.

Style	Part Number	Contact Style	Approvals & Rating (250VAC)	Drawings	Mounting
Straight cable entry, 65°C  UL 94V-0 flammability rating	**83011152**	screw terminals	10A	 Max. cable size: 3x1.00mm² or 3x16AWG (Note: requires removal of bend relief which may affect UL & CSA approvals) **Assembly instructions:** Strip wires as shown • Open plug • Slide prepared cable through plug bend relief • Connect conductor wires • Lock cable under strain relief clamp • Reassemble plug	
Straight cable entry, 65°C  UL 94V-0 flammability rating	**83012500**	screw terminals	10A 15A	 **Assembly instructions:** Strip wires as shown • Open plug • Slide prepared cable through plug bend relief • Connect conductor wires • Lock cable under strain relief clamp • Reassemble plug	
	83012520 (Angled cable mount 65°C, not pictured)	screw terminals	10A 15A		

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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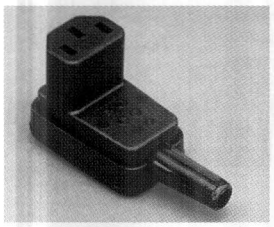
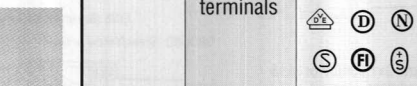
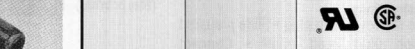
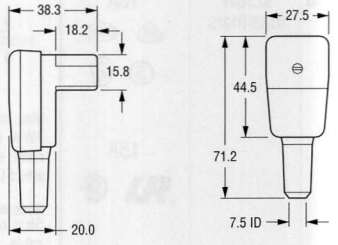
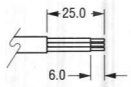
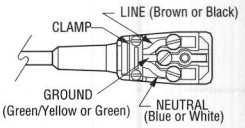
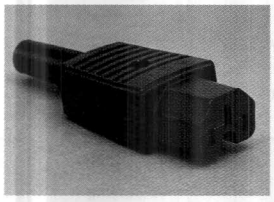
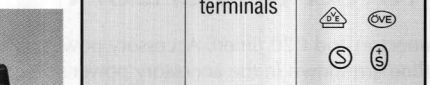
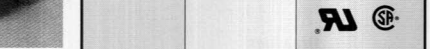
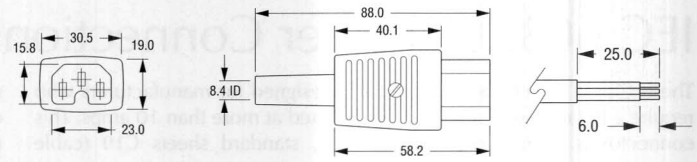
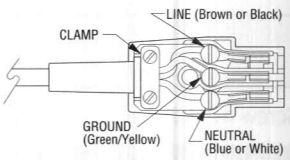
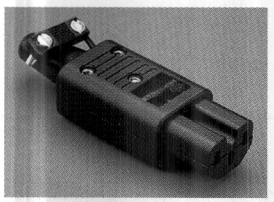
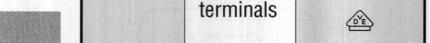
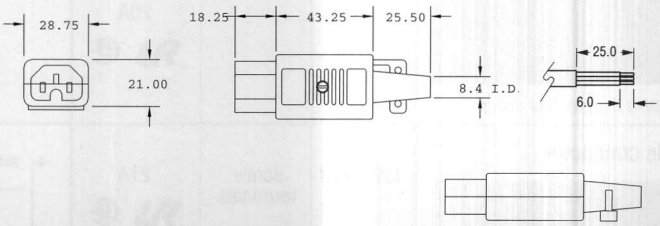
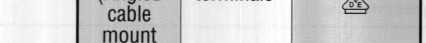
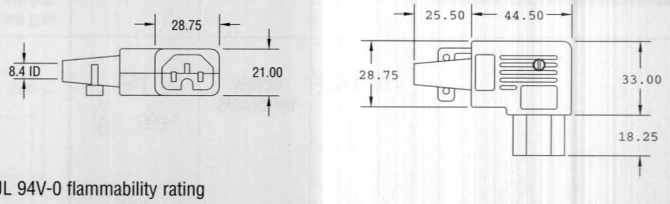
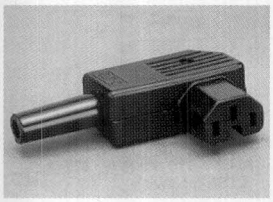
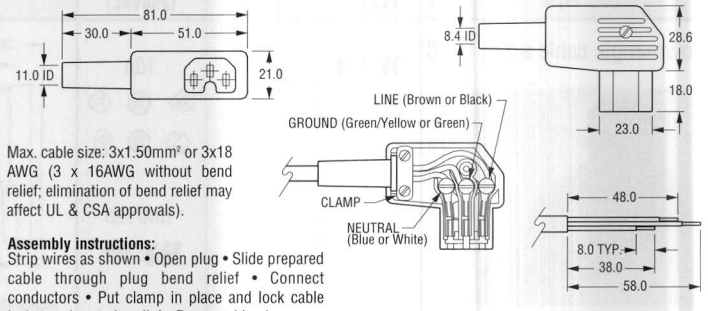
IEC 60320* Rewirable Cable Connectors, cont.

Style	Part Number	Contact Style	Approvals & Rating (250VAC)	Drawings	Mounting
Down-angle cable entry, 65°C 	**83011141**	screw terminals	10A  15A/125 	 **Assembly instructions:** Strip wires as shown • Open plug • Slide prepared cable through plug bend relief • Connect conductors • Put clamp in place and lock cable jacket under strain relief • Reassemble plug.	 Max. cable size: 3x1.00mm² or 3x18AWG (Note: requires removal of bend relief which may negate UL & CSA approvals). 
Cable mount, 120°C 	**8943W60**	screw terminals	10A  15A 	 Max. cable size: 3x1.50mm² or 3x18 AWG (3 x 16AWG without bend relief; elimination of bend relief may affect UL & CSA approvals). **Assembly instructions:** Strip wires as shown • Open plug • Slide prepared cable through plug bend relief • Connect conductors • Put clamp in place and lock cable jacket under strain relief • Reassemble plug.	
Cable mount, 120°C 	**83012700**	screw terminals	10A  15A	 **Assembly instructions:** Strip wires as shown • Open plug • Slide prepared cable through plug bend relief • Connect conductors • Put clamp in place and lock cable jacket under strain relief • Reassemble plug.	
	83012720 (Angled cable mount 120°C, not pictured)	screw terminals	10A  15A	 UL 94V-0 flammability rating	

Dimensions in mm

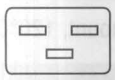
* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

IEC 60320* Rewirable Cable Connectors, cont.

Style	Part Number	Contact Style	Approvals & Rating (250VAC)	Drawings / Mounting
Angled cable mount, 120°C 	**8943LW60**	screw terminals	10A 15A	 Max. cable size: 3x1.50mm² or 3x18 AWG (3 x 16AWG without bend relief; elimination of bend relief may affect UL & CSA approvals). **Assembly instructions:** Strip wires as shown • Open plug • Slide prepared cable through plug bend relief • Connect conductors • Put clamp in place and lock cable jacket under strain relief • Reassemble plug.

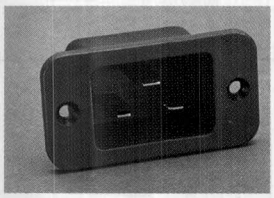
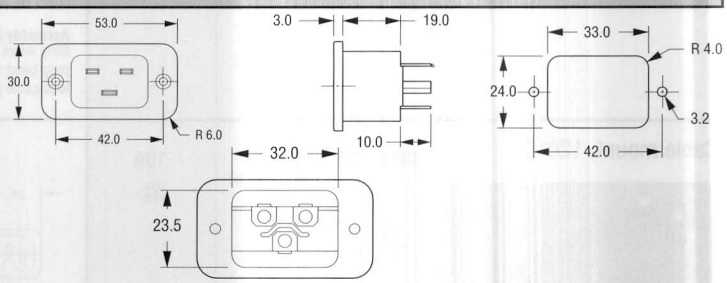
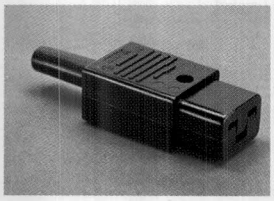
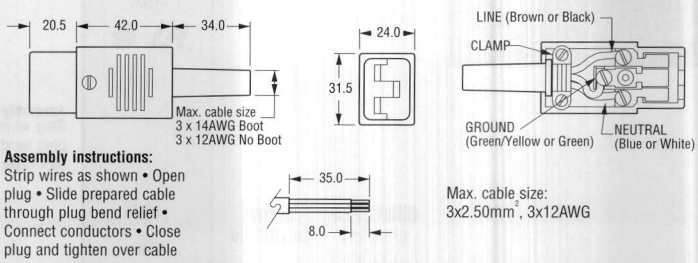
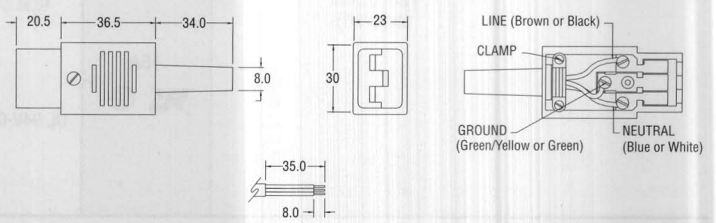
Dimensions in mm

IEC 60320* Power Connections rated at 16/20A



65°C

These Class I connectors are specially designed for manufacturers who require a detachable connector system rated at more than 10 amps. This connector is described in IEC 60320*, standard sheets C19 (cable connector) and C20 (inlet). Accessory power connectors using the same outline are shown in the accessory power section on page 200. Materials: Nylon insulator; contacts are nickel plated brass.

Style	Part Number	Contact Style	Approvals & Rating (250VAC)	Drawings / Mounting
Screw mount inlet  UL 94V-0 flammability rating.	**83011340**	6.3mm QD tabs	16A 20A	
Cable connector 	**83011380**	screw terminals	21A	 **Assembly instructions:** Strip wires as shown • Open plug • Slide prepared cable through plug bend relief • Connect conductors • Close plug and tighten over cable Max. cable size: 3x2.50mm², 3x12AWG
	83011430	screw terminals	16A 20A	

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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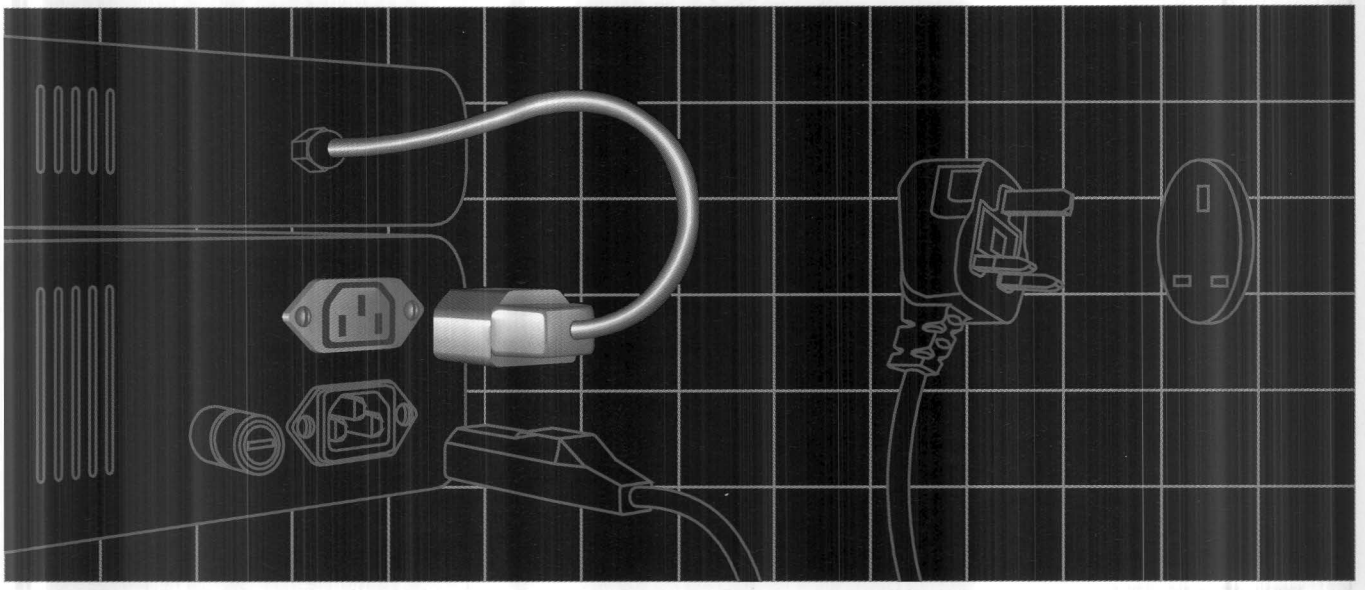
TOLL-FREE (U.S./Can./P.R./V.I.)
Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360

Accessory Power Distribution

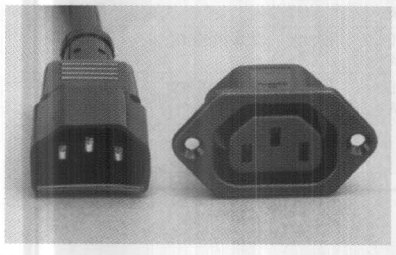


Accessories and peripherals to computers and test equipment can be powered almost anywhere in the world in applications rated up to 10 amps by the use of an accessory power system based on the international IEC 60320* connector system. (The NEMA 5-15R used in North America should **not** be used in international markets.)

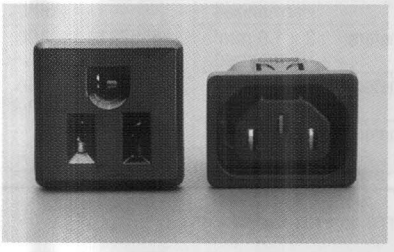
The Accessory Power Strips (see page 196) are connected to the foreign power mains directly via any international cordset (such as those included in our Designer's Kit of International Cordsets shown on page 74). The cordset is plugged into the IEC 60320* power inlet of the Accessory Power Strip. Accessories are powered through jumper cordsets from the IEC 60320* power outlets. The Accessory Power Strips have circuit protection at 10A which is provided by the circuit breaker. The four position model is CSA certified, UL recognized, and VDE tested. It also carries the Gutachten which is a test report issued by VDE covering components or devices not described in VDE standards. The six position currently carries CSA certification and UL recognition only.

North American and European cordage constructions require different jumper cords because of the differences in cordage standards. The cordsets on page 196 meet various European standards and carry appropriate approvals, as well as CSA certification. Models are also available with CSA certification and UL recognition for use in North America. The PC Adapter Cord (86560001, top of page 197) is specifically designed to supply power to a monitor or peripheral used in connection with a personal computer. The "reverse" IEC 60320* connector of 86560001 plugs into the back of your PC; the NEMA 5-15R receptacle on the other end accepts the power plug from a monitor or peripheral. This allows the PC's main power switch to also control the power to the monitor. As 86560001 utilizes the NEMA 5-15R receptacle and AWG-type cordage, it is designed for use in North America only.

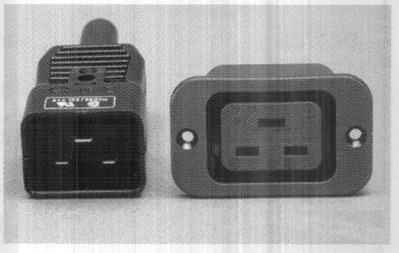
Individual "reverse" IEC 60320* outlets and connectors are shown on pages 198-199. IEC 60320* accessory power connections are available for ratings of 16-20A. These accessory power connectors are shown on page 199 and are patterned on the IEC 60320* connectors shown on page 192.



"Reverse" IEC 60320 connectors used for international accessory power connections.*



Do not use the NEMA 5-15R receptacle (above, at left) as an accessory outlet on an exported product. A "reverse" IEC 60320 connector (above, right) is commonly used for accessory power applications in international markets.*



IEC 60320 accessory power connections rated 16-20A—see page 200.*

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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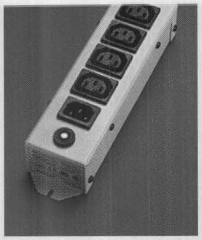
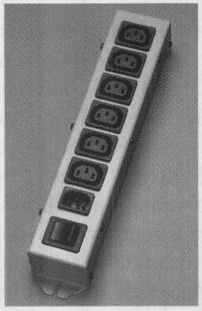
TOLL-FREE (U.S./Can./P.R./V.I.)
Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360



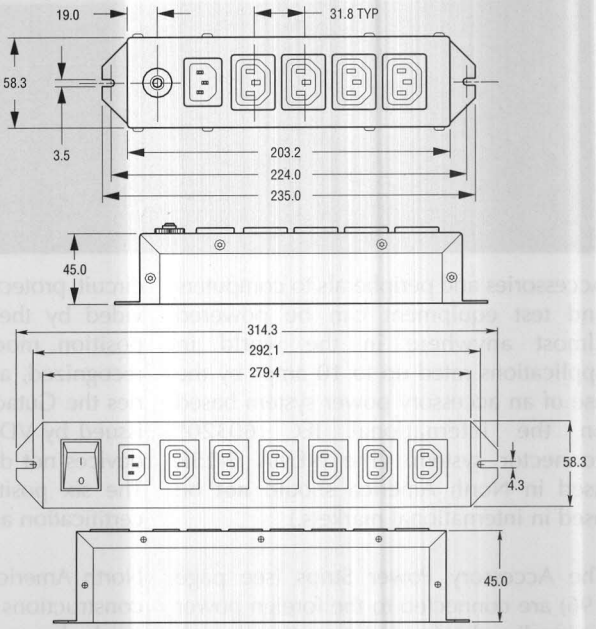
Interpower™ Accessory Four Position Power Strip

85010070: Interpower™ Accessory Power Strip contains one IEC 60320* power inlet; four "reverse" IEC 60320* power outlets. 10 amp single pole circuit breaker; beige metal casing.
Approvals: UL recognized, CSA certified, VDE Gutachten
Rating: (10A/250VAC)



Interpower™ Accessory Six Position Power Strip

85010080: Interpower™ Accessory Power Strip contains one IEC 60320* power inlet; six "reverse" IEC 60320* power outlets. 10 amp double pole circuit breaker; beige metal casing.
Approvals: UL, CSA
Rating: (10A/250VAC)



"Universal" Jumper Cordsets

Interpower's "Universal" Jumper cordset for use with Interpower™ Accessory Power Strip (shown above); meets requirements of international safety agencies.

Part No.	Current Rating	Maximum Temp. (°C)	Color	Length (± 0.1m)	Cable
86557000	10A 250VAC	60°/CSA 65°/VDE	Black	1.0 meter	3 x 1.0 mm² Harmonized
86557010	10A 250VAC	60°/CSA 65°/VDE	Black	2.5 meters	3 x 1.0 mm² Harmonized
86557030	10A 250VAC	60°/CSA 65°/VDE	Black	0.5 meters	3 x 1.0 mm² Harmonized
86557040	10A 250VAC	60°/CSA 65°/VDE	Black	1.5 meters	3 x 1.0 mm² Harmonized
86557050	10A 250VAC	60°/CSA 65°/VDE	Black	2.0 meters	3 x 1.0 mm² Harmonized

Jumper cordsets listed below carry the same approvals and ratings, but vary in length. Approvals: VDE, SEV, CSA cert., BSI, SEMKO, DEMKO, FIMKO, IMQ, KEMA, OVE, NEMKO, LCIE, CEBEC(10A/250VAC)

Part No.	Current Rating	Maximum Temp. (°C)	Color	Length (± 0.1m)	Cable
86557060	10A 250VAC	60°/CSA 65°/VDE	Black	3.0 meters	3 x 1.0 mm² Harmonized
86557300	10A 250VAC	60°/UL & CSA	Black	1.0 meters	3 x 18 AWG
86557310	10A 250VAC	60°/UL & CSA	Black	2.5 meters	3 x 18 AWG
86557320	10A 250VAC	60°/UL & CSA	Black	3.0 meters	3 x 18 AWG

Dimensions in mm

Designer's Kit of International Cordsets

Part Number: 86599011 Supply power to the International Power Strip through any of the nine International cordsets in the Designer's Kit of International Cordsets. All cordsets in the kit are terminated with the IEC 60320* connector. See page 74 (Cord & Cordset section) or page 220 (Kits and Panels section) for more information.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

† These parts carry UL Recognition and CSA Certification only.

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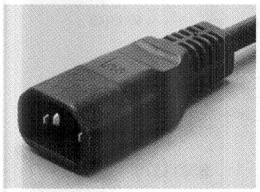
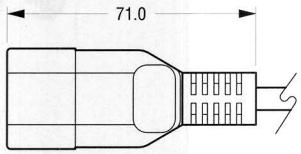
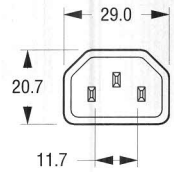
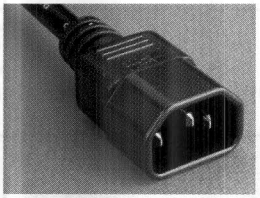
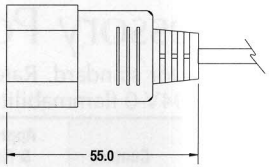
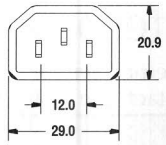
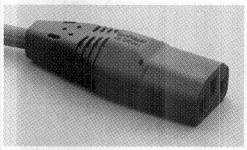
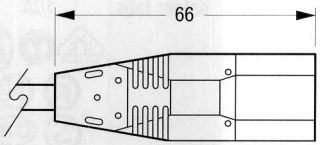
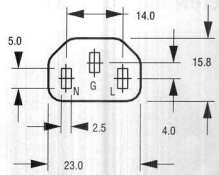
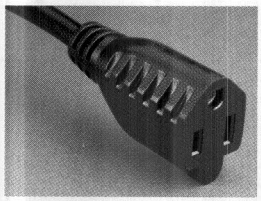
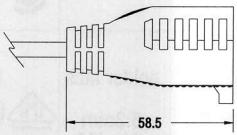
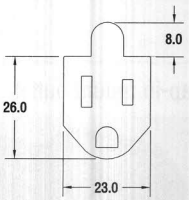
End Termination Specifications

(PVC molding)

Connector approvals	Drawings	END VIEW
 **TF1** **Country** **Agency** Canada CSA Germany VDE Switzerland SEV U.S. UL		
 **TF2** **Country** **Agency** Canada CSA		
 **TC1** **Country** **Agency** Austria OVE Australia DOE Belgium CEBEC Denmark DEMKO Canada CSA Finland FIMKO Germany VDE Netherlands KEMA Sweden SEMKO Switzerland SEV U.S. UL		
 **TE1** **Country** **Agency** Canada CSA		

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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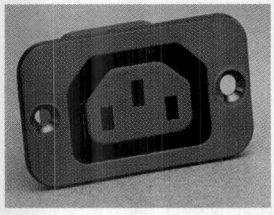
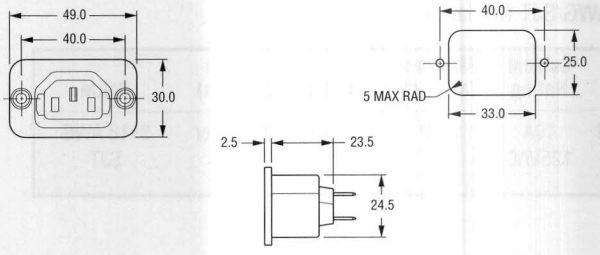
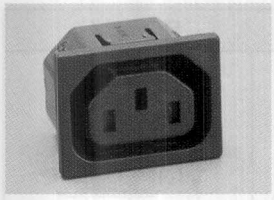
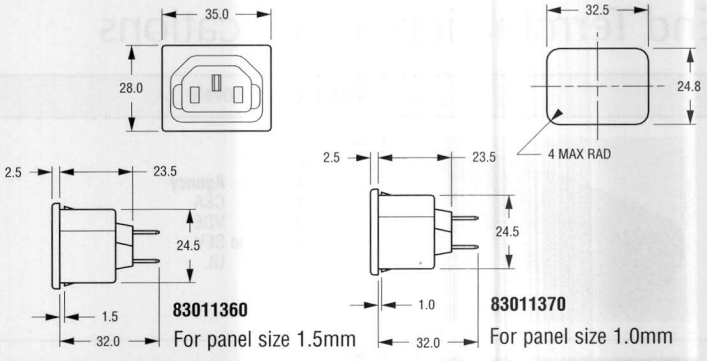
Accessory Power Outlets—Safety Shuttered

65°C

Patterned on the IEC 60320* connector standard. Push-in models available for 1.5 and 1.0mm panels. Special safety feature: Line and neutral contacts are shuttered to prevent contact with object other than mating plug. Rated 65°C. Materials: Insulators, polyamide-type thermoplastic; contacts, tin-plated brass. UL 94V-0 flammability rating.

Style	Part Number	Contact Style	Approvals & Rating (250VAC)	Drawings	Mounting
Screw-mount outlet 	**83011220**	6.3mm solder/QDs	10A		
Snap-in outlet 	**83011360**	6.3mm QDs	10A		
	83011370	6.3mm QDs			

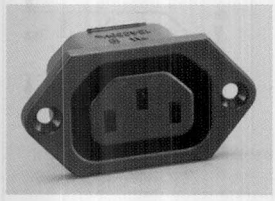
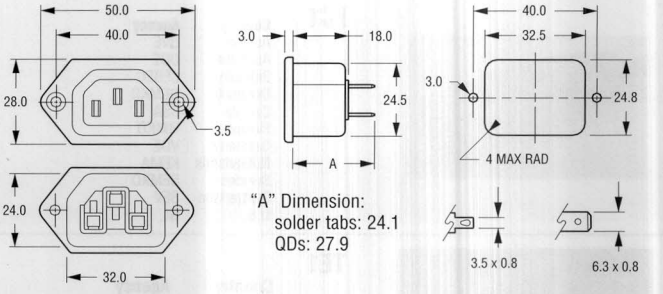
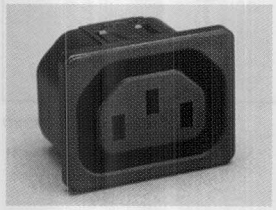
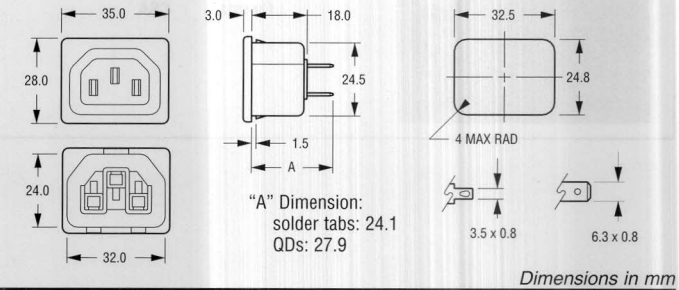
83011360 For panel size 1.5mm

83011370 For panel size 1.0mm

Interpower™ Accessory Power Outlets

65°C

Patterned on the IEC 60320* connector standard. Rated 65°C. Materials: Insulators molded from a polyamide-type thermoplastic; contacts are nickel-plated brass. UL 94V-0 flammability rating.

Style	Part Number	Contact Style	Approvals & Rating (250VAC)	Drawings	Mounting
Screw mount outlet 	**8301511**	solder tabs	10A		
	8301512	6.3mm solder/QDs	15A		
Snap-in mount outlet  For panel size 1.5mm	**8301611**	solder tabs	10A		
	8301612	6.3mm solder/QDs	15A		

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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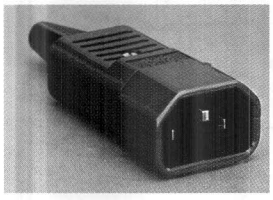
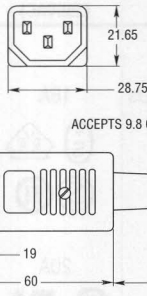
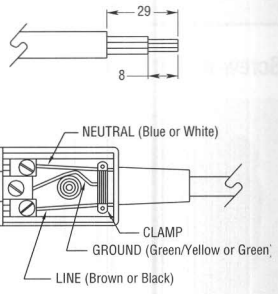
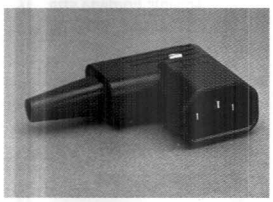
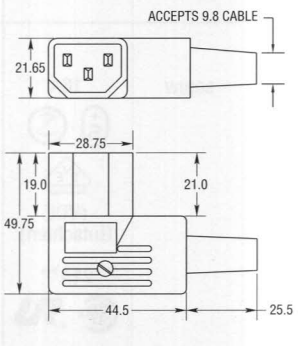
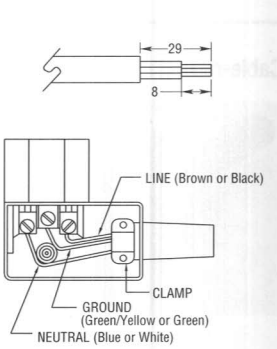
Accessory Power Connectors

65°C

Patterned on the IEC 60320* connector standard. Rated 65°C. Made-to-order assembly services are available; see pages 75-86 for more information. Materials: Insulators molded from Noryl V0 150B. UL 94V-0 flammability rating. Contacts are nickel-plated brass.

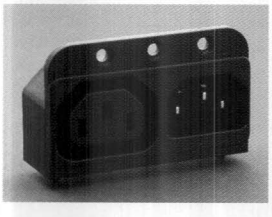
Style	Part Number	Contact Style	Approvals & Rating (250VAC)	Drawings	Mounting
Cable mount—straight entry 	**83011060**	screw	10A 15A		
Cable mount—angled entry 	**83011070**	screw	10A 15A		

83011060 Assembly Instructions:
Strip wires as shown • Open plug • Slide prepared cable through plug bend relief • Connect conductors • Put clamp in place and tighten over cable • Reassemble plug

83011070 Assembly Instructions:
Strip wires as shown • Open plug • Slide prepared cable through plug bend relief • Connect conductors • Put clamp in place and tighten over cable • Reassemble plug

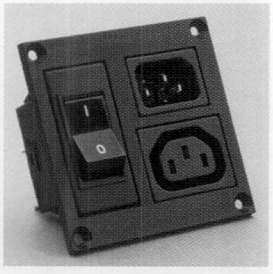
Accessory Modules

These multifunction modules include an accessory outlet. Use them instead of individual components to save space and combine functions. A full description of each part is given in the Power Module section on the pages referenced.



83511400: see page 184

PC board mounting module combines IEC 60320* inlet and an accessory power outlet



83110150: see page 180
Note: specify circuit breaker separately; see page 181.

Module combines IEC 60320* inlet, accessory outlet, and a circuit breaker.

Dimensions in mm

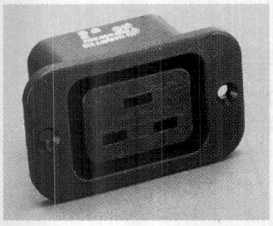
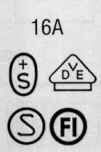
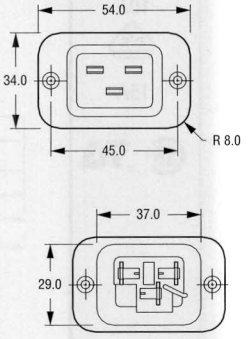
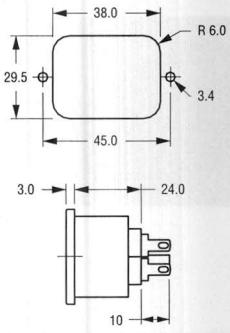
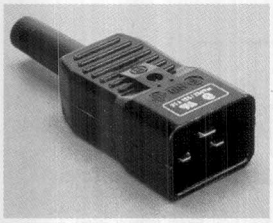
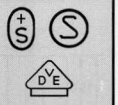
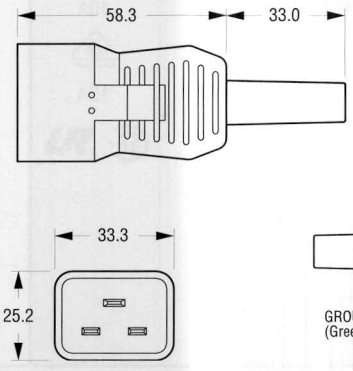
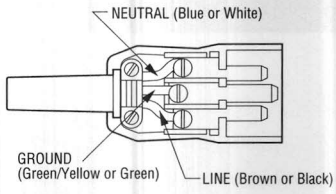
* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

16/21A Accessory Power Connections

65°C

These accessory power connectors are rated at 16A/250VAC (20A North America) and are based on the connector system described in IEC 60320*, standard sheets C19 & C20. See page 194 for these connectors.

Materials: Polyamide insulator. UL flammability rating of part 83011350 is UL 94V-2.

Style	Part Number	Contact Style	Approvals & Rating (250VAC)	Drawings	Mounting
Screw-mount outlet 	**83011350**	6.3mm QDs	16A  20A		
Cable-mount Plug Connector 	**83011390**	screw	16A  (VDE Gutachten) 21A**		Accepts cordage sizes to 3x1.50mm², 3x16AWG 

Dimensions in mm

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

** Rating is limited to 18A when used with 3x14 AWG cordage

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Switches, Circuit Breakers, Voltage Selectors

Switches

The rocker power switches in this section are intended for use in mains power applications on equipment which will be sold globally. They carry agency approvals, current ratings, and contact spacings that are appropriate for global applications and they fit in industry standard panel cutouts. In all cases, they are the double pole, single throw switches which allow simultaneous switching of both current carrying conductors as required in most international standards and accepted by North American standards agencies.

Rocker actuators are increasingly popular on power switches because they protrude very little beyond the panel on which they are mounted. They are also very practical because the switch itself contains the markings that indicate position. This eliminates the need for separate power status indicators. Rocker switches are harder to accidently actuate than push-button. Furthermore, they generally will handle more current than push-button or slide switches because a snap action switch design can be used. All of these switches have black rocker actuators with white markings.

The silver plated contacts which are contained in these switches, are generally specified for most electrical and electronic applications including computers, power supplies, power tools, industrial controls, instrumentation, medical, and telecommunications. Connections are made via either 6.3 mm or 4.8 mm quick disconnects. And, these switches snap directly into a panel with no additional hardware required. These features save assembly labor.

North American and international test agencies test power switches differently and the result frequently is that the same switch will have different performance ratings for North American and international service. Furthermore, the rating information is presented differently.

Under UL and CSA procedures, a switch is assigned a rating code based on its performance during UL or CSA administered tests. The rating code defines the rated loads for both resistive and motor applications. A switch which has a rating code R70, for example, is rated for service at 16A, 125-250 VAC, for 1/4 HP at 125 VAC and for 1/2 HP at 250 VAC. The UL/CSA ambient temperature rating is 65°C.

International ratings for the same switch will be expressed as 16(4)A/250V~ or T100. This translates as 16A with a resistive load, 4 amps with an inductive or motor load, 250 VAC maximum operating voltage, and 100° maximum ambient operating temperature.

In some applications, our standard switches may not be appropriate because requirements dictate a different rocker color, a lighted switch, a higher in-rush rating, or different contacts. Modifications to accommodate these requirements are generally available with longer lead times and minimum orders that will range from 100 to 5000 pieces depending on the model and the modification requested. Non-standard components are sometimes essential to the success of a product and we will be happy to quote price and delivery on rocker switches produced to your specifications.

Voltage Selectors

Voltage selectors look physically very much like switches however they are **not** designed to be switched under load. The load should be disconnected from the power mains before the selector is switched. In order to discourage use by non-technical personnel, voltage selectors are generally designed to require the use of a tool such as a screwdriver. Because of the dangers involved in incorrectly changing a voltage selector, many equipment manufacturers will take the additional step of installing the selector so that it is not operator accessible. This makes the voltage selector less convenient to the user but since most equipment is not moved after it is first installed, this is rarely a problem for the user.

The voltage selector described on page 204 is a double pole, double throw (DPDT) switch. It provides switching of the primary side of a split coil power input transformer between series (230V) and parallel (115V) configurations. Rotary selectors are also available from other suppliers. They offer up to six positions and some models offer the ability to connect relatively complex series-parallel combinations of primary transformer windings. Rotary selectors are 2-4 times as expensive and require more panel space. Modern switching power supply designs are generally tolerant of input voltage deviations of at least ±10%, eliminating the need for more than two selector positions. The slide style, two-position voltage selector provides a cost effective, easy-to-apply solution for most input voltage selections applications.

For additional voltage selector options, see the Selection Chart on page 171 of the IEC 60320* Power Inlets and Multifunction Modules section. We offer three additional voltage selector styles in these modules.

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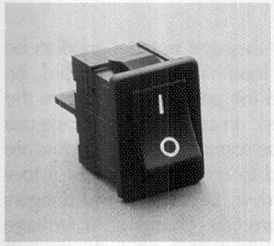
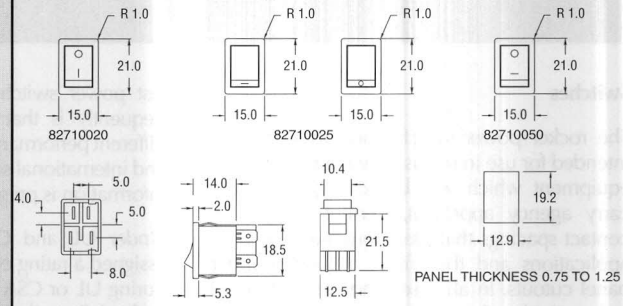
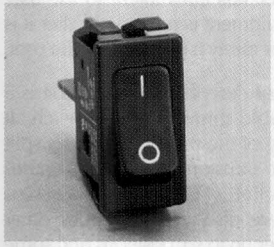
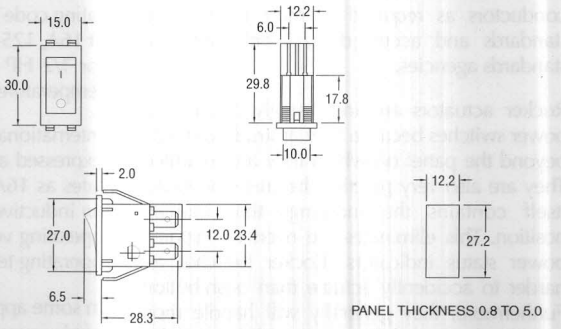
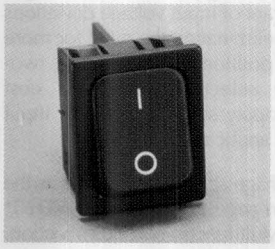
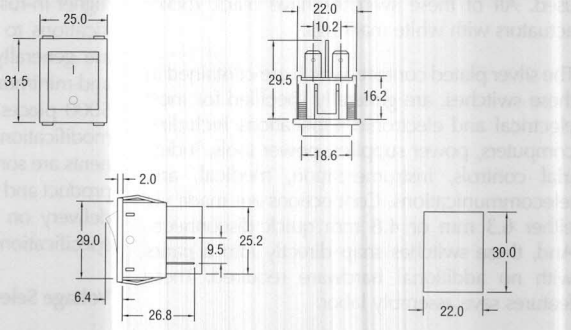
terminals. Contacts refer to internal switch contacts.

Style	Part Number	Terminal Style	Number of terms.	Approvals & Rating (VAC)	Drawings	Mounting
	**82710020** **82710025** **82710050**	4.8mm QD 4.8mm QD 4.8mm QD	4 4 4	Rating — see above		
	**82710030**	6.3mm QD	4	Rating — see above		
	**82710040**	6.3mm QD	4	Rating — see above		

PANEL THICKNESS 0.75 TO 1.25

PANEL THICKNESS 0.8 TO 5.0

PANEL THICKNESS 0.75 TO 1.25

Dimensions in mm

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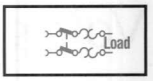
Circuit Breakers—order separately:



SPECIFICATIONS:

2-pole with thermal sensing. Specify part number and amperage rating.

Trip free—cannot be held closed against an overload; rocker will travel to OFF position.

Maximum voltage: 250VAC

Maximum interrupting capacity: 10x rated current up to 2A; 300A for models 4A and above

Life: 25,000 cycles at rated current

Dielectric strength: 2000VAC

Insulation resistance: 100 megohms

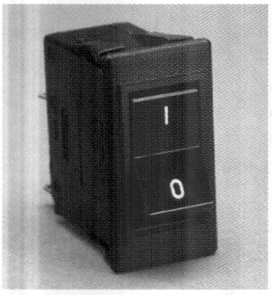
Operating temperature range: -30° to 60°C

Shock resistance: 30 g (IEC 60068-2-27*, Ea)

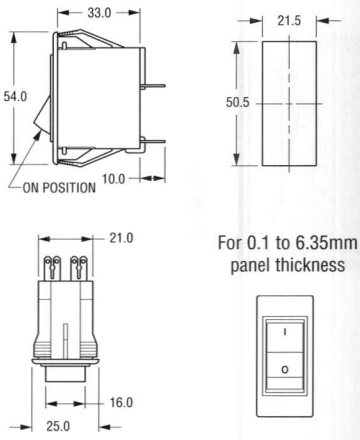
Vibration resistance: 8 g (IEC 60068-2-6*, Fc/A)

Humidity: 95% at 40°C (IEC 60068-2-30*, C)

Snap-in mounting

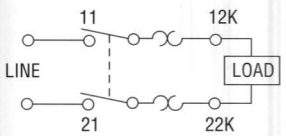


Part Number	Contact Style	Current Rating (250VAC)	No. of contacts	VDE Interrupt. cap.	Internal resistance (Ω)	Approvals
82910010	6.3mm QD/solder tabs	1A	4	10A	1.8	
82910020	6.3mm QD/solder tabs	2A	4	20A	0.54	
82910030	6.3mm QD/solder tabs	4A	4	300A	0.087	
82910040	6.3mm QD/solder tabs	6A	4	300A	0.043	
82910050	6.3mm QD/solder tabs	8A	4	300A	0.033	
82910060	6.3mm QD/solder tabs	10A	4	300A	< 0.04	
82910080	6.3mm QD/solder tabs	15A	4	300A	< 0.04	



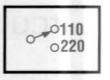
Dimensions in mm

Trip current is 140% of rated current. Tripping time in seconds at (23°C) at various overload levels:							
OVERLOAD LEVEL:	100%	200%	300%	400%	500%	600%	1000%
1-2A ratings: (curve 382.280/2)	No trip	10-60 sec.	3.5-15 sec.	2-7 sec.	1.5-5 sec.	1-3.5 sec.	0.8-2 sec.
4-10A ratings: (curve 382.280/3)	No trip	8-40 sec.	3-10 sec.	1.5-5 sec.	1-3 sec.	0.6-2 sec.	0.2-1 sec.



* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Voltage Selector (Double pole, Double throw)



Double pole, double throw voltage selector slides to select 230V or 115V.

Note: This voltage selector is not designed to be switched under load.

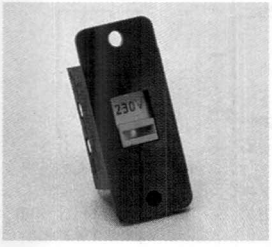
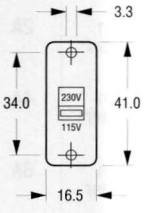
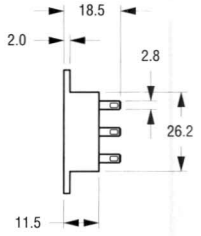
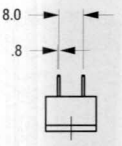
Part Number:	83710030
UL/CSA Rating:	R48 10A @ 125VAC 5A @ 250VAC
VDE Rating	5A/250VAC 10A/125VAC
Electrical Life	10,000 cycles
Mechanical Life	10,000 cycles

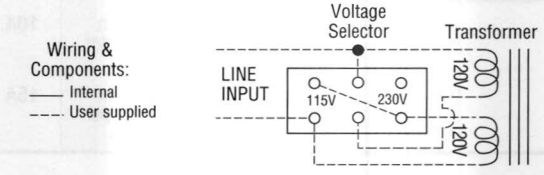
SPECIFICATIONS: See chart at right for ratings

Materials:

Slide and housing: thermoplastic
Terminals:* silver plated
Contacts:* silver plated, copper/tin alloy

** In this section only, external connections are referred to as "terminals." "Contacts" refer to* internal *switch contacts.*

Style	Part Number	Terminal Style	Number of terms.	Approvals & Rating (VAC)	Drawings	Mounting
	**83710030**	2.8mm solder tabs	6	Rating — see above	  	



Dimensions in mm

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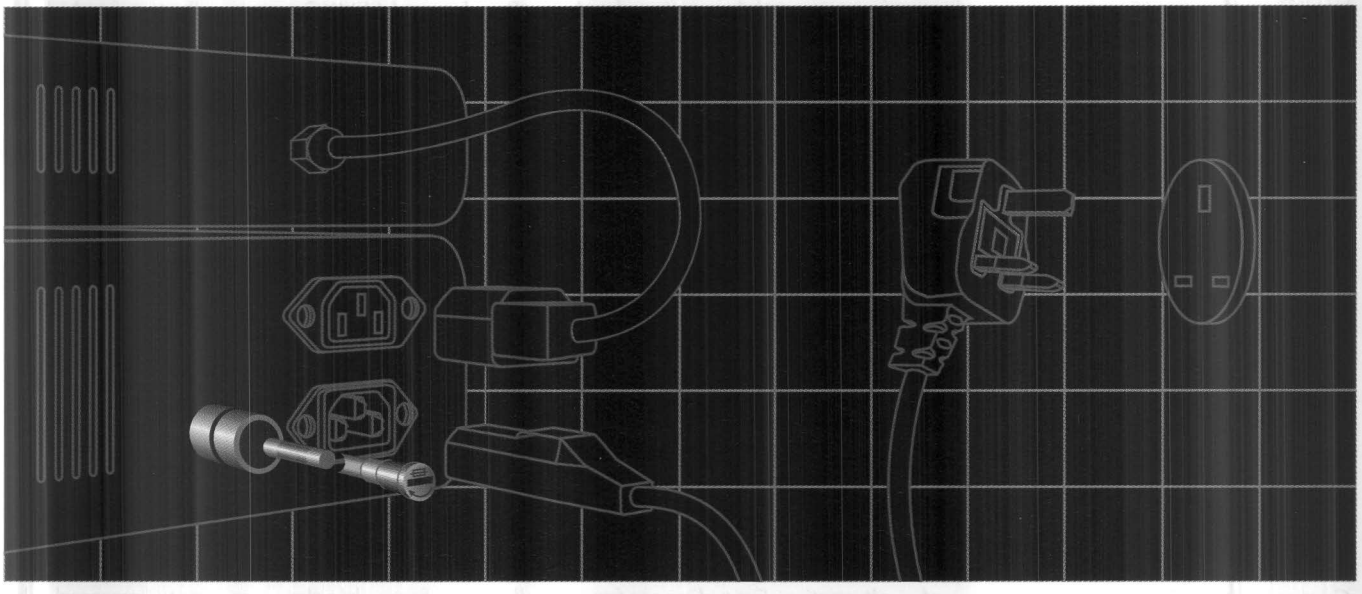
Fuses & Fuseholders



Designers of equipment that will be used worldwide frequently choose to protect electronic equipment with fuses rather than circuit breakers. The lower cost of fuses is certainly a factor, but more important is the ease with which fuse-protected products can be modified to accommodate the various input voltages used worldwide. For example, a device protected with a 6A fuse when connected to the 115VAC mains in North America will usually be protected at approximately 3 amps when connected to foreign power mains at 220-250VAC. When used with a fuseholder, a fuse can be easily and quickly changed, whereas a change in a circuit breaker will involve several disconnection, dismounting and re-assembly steps.

A circuit protection strategy based on the use of fuses is complicated somewhat by the presence of two commonly used fuse sizes: the 1/4 x 1 1/4" (6.3 x 32mm) standard in North America and the smaller 5 x 20mm fuse used as a standard in the rest of the world. The 1/4 x 1 1/4" fuse is generally available in North America and in newly industrialized nations (Korea and Taiwan, for example) in which equipment is produced in large quantities for sale in the U.S. and Canada. The 1/4 x 1 1/4" fuse is not generally available elsewhere in the world. The 5 x 20mm fuse, on the other hand, is generally available outside of North America and, to an increasing extent, in the U.S. and Canada. Circuit protection strategies should take these issues into account.

With regard to fuse specification, the equipment designer has three possible strategies from which to choose, all of which impact the fuseholder specification decision.

Fuse and Fuseholder Design Strategies

The first strategy is to specify the North American 1/4 x 1 1/4" fuse for products sold worldwide. Although this practice may allow the designer to continue using fuses and fuseholders that are familiar, and in the process avoid any component changes, it will present the customer outside of North America with the burden of replacing the 1/4 x 1 1/4" fuse that will be difficult to source locally. Furthermore, most commonly used North American fuseholders that accept 1/4 x 1 1/4" fuses are not approved for use by international test agencies (VDE and SEMKO, for example). Assuming that the objective is to make one product for sale worldwide, particularly one that is "friendly" to the overseas customer and at the same time conforms to foreign safety requirements, specification of 1/4 x 1 1/4" fuses is not an acceptable alternative.

A second strategy is to specify 5 x 20mm fuses for use on equipment sold worldwide. This alternative again offers the simplicity of a single fuse size and, in addition, the opportunity to use a fuseholder that requires less space behind the panel. The 5 x 20mm fuseholder is shorter simply because the fuse is shorter (20mm vs. 32mm). Fuseholders which accept only the 5 x 20mm fuses are available with UL recognition, CSA certification, and VDE and SEMKO approvals. In addition, some power entry modules, which combine a fuseholder with an AC power inlet, power switch or voltage selector, and an RFI filter, accept only the 5 x 20mm fuse. This is particularly true of the smallest models available.

Although the fuse size remains the same worldwide under this strategy, it is important to recognize that two different 5 x 20mm fuses must be used: a UL-recognized and CSA-certified fuse for North America, and a SEMKO-approved fuse for use internationally. The time-current characteristics of these fuses are different, and in order to comply with applicable agency requirements, the appropriate fuse type must be used. In one respect, the need to use two fuses is a minor inconvenience because the different current ratings imposed by higher international voltages will dictate the use of two different fuses for each product anyway. However, the different fuses are virtually identical in appearance, and it is very easy to

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confuse them. The only apparent differences frequently are the markings embossed on the fuse cap, and they can be difficult to read. The decision to adopt a 5 x 20mm-only fusing strategy will hinge, therefore, on the importance attached to using a 5 x 20mm-only fuseholder and the designer's assessment of how easy it will be for the customer to replace blown fuses.

A third strategy is to specify 1/4 x 1 1/4" fuses for use in North America and 5 x 20mm fuses in other parts of the world. This can be accomplished with one fuseholder, provided that a combination 1/4 x 1 1/4", 5 x 20mm fuse capacity type is specified. Panel Components Corporation's fuseholders described on pages 212-214 all accept both fuse sizes. (Many power entry modules also accept both fuse sizes; call for more information on Panel Components Corporation's line of modules or see the catalog section on multifunction power modules & inlets pages 169.) This strategy allows the equipment designer to assure that the product is user friendly in that the end user will have a fuse that can be easily replaced anywhere in the world. It also assures that local safety requirements are being met because these fuseholders are recognized, certified and approved by both North American and foreign test agencies.

Although combination fuseholders are approximately the same length as fuseholders that accept only the 1/4 x 1 1/4" fuse, models offered by Panel Components Corporation are available in both low- and high-profile configurations with straight and angled contacts to conform to most packaging constraints. Connections may be made via either the popular 0.25" (6.3mm) quick disconnect or a combination solder/0.187" (4.8mm) quick disconnect. Finally, combination fuseholders in this third strategy with either a standard mounting nut or via a snap-in mounting system.

Not all applications call for a post-style, panel-mounting fuseholder. Fuse blocks offer an open fuseholder suitable for use inside electrical equipment. They are usually less expensive than post-style fuseholders and, if the fuse is rarely if ever changed, offer an attractive alternative. Fuse clips are functionally the same as fuse blocks except that they don't incorporate an integral insulator. They are intended for use on printed circuit or insulated terminal boards and, again, inside the equipment.

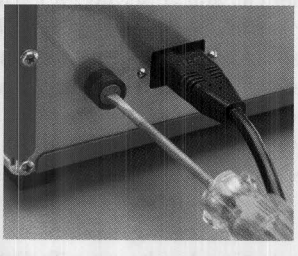
The required range of agency approvals on fuseholders varies by the specific type of device. Post-style, panel-mounting fuseholders are the most widely regulated because they are usually user accessible. The specifier should require UL recognition, CSA certification, VDE, and SEMKO approvals if the objective is to build a global product. Although VDE and SEMKO supposedly test fuseholders to the same standards and with the same procedures, test results often vary. Furthermore, SEMKO test results on useholders are generally accepted by agencies in the other Nordic countries (Norway, Finland and Denmark), whereas VDE test results on fuseholders are widely accepted by the rest of the European test agencies. Other competitive fuseholder manufacturers also offer SEV approval. This approval is essential for the *fuseholder manufacturers* who will sell in Switzerland; however, it is not necessary for the *equipment manufacturer* who incorporates the fuseholder into equipment that will be sold in Switzerland. UL and CSA will test and recognize or certify fuse blocks. Because fuse blocks are not covered by IEC 60127-6*, European test agencies do not test or approve them except as components of a complete system. No agency tests or grants component-level approval on fuse clips; they must be approved as part of a complete system.

Finally, the specifier will quickly note that various test agencies do not all rate a particular fuseholder for service at the same current rating. SEMKO limits post-type, panel-mounting fuseholders to

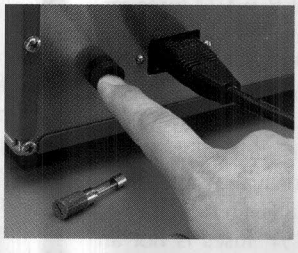
Fuse Accessibility is Limited Under international Standards

Users of fuseholders designed to comply only with UL and CSA requirements are accustomed to a fuse carrier with a knurled cap that makes it easy to access and change a fuse without any tools. Various international equipment standards, however, limit the degree of user accessibility to a fuseholder in order to minimize the possibility of electrical shock to a non-technical user.

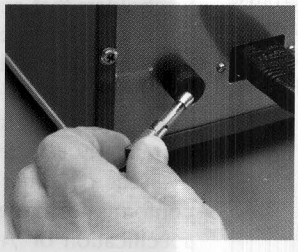
The limited access fuseholder is designed to require the use of a tool (usually a screwdriver). It also incorporates additional insulation and insulating barriers that eliminate the presence of live conducting surfaces during fuse change operations. The limited access ("touchproof") fuseholder possesses four important characteristics as illustrated below:



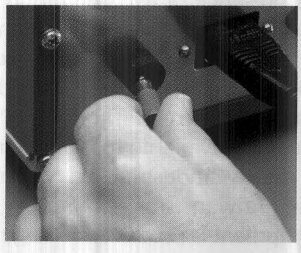
Fuseholder is accessible with a tool only



Contacts are recessed and protected



Fuse carrier is insulated



Fuse carrier is retained in a spring-loaded carrier

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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6.3 amps, VDE to 10 amps, and UL and CSA from 12-20 amps depending on performance. The SEMKO and VDE limits are derived from their limits on the use of 5 x 20mm fuses. The UL and CSA limits are based on temperature rise in tests that attempt to simulate worst-case scenarios. Differences in results are usually a function of the differences in test procedures.

A fuse is an intentionally specified weak link in an electrical circuit designed to protect the equipment operator and the load circuitry from an overcurrent condition. Power systems fuses are normally located, electrically, in the product immediately after the power cord and ahead of power switches and other related power systems components. An exception is sometimes made for the RFI power line filter which, when combined with an AC connector, may dictate that the fuse be located, electrically, directly behind it. As a result, power systems fuses used in electronic equipment normally operate at nominal voltages ranging from 100-250VAC.

Differences Between North American & International Fuses

As mentioned in the previous section, there are differences between North American and international fuses, the first difference being size. A second difference is the standards to which fuses are manufactured: North American fuses are manufactured in accordance with UL 198G and/or CSA 22.2 No. 59-1972. International fuses are manufactured in accordance with IEC 60127*. A third important difference is the time-current or clearing time characteristic. Because North American fuses are manufactured to standards fundamentally different from international types (UL 198G vs. IEC 60127*), the speed with which a fuse will blow under certain overcurrent conditions and hence the nature of the primary circuit protection that is offered can be considerably different. (The actual requirements of each of the standards are illustrated in Figure 1.) The approaches to clearing time specifications between the two standards are completely different. UL and CSA specify that the fuse must not open with load conditions less than 110% of rated current. IEC 60127*, on the other hand, requires fuses to withstand currents of 120% of rated current for a minimum of 100 cycles. It defines each cycle as the product being on for one hour and off for fifteen minutes, followed by one hour at 150% of rated current.

UL and CSA define "Fast-Acting" and "Time-Delay" classes of fuses. IEC 60127* differentiates between classes of fuses as follows:

IEC 60127* Sheet Number	Clearing Time	Symbol	Breaking Capacity
I	Quick-Acting	F	High
II	Quick-Acting	F	Low
III	Time-Lag	T	Low
V	Time-Lag	T	High

See Figure 1 below for a comparison of time-current characteristics between UL/CSA standards and IEC. The two standards are fairly different; the 1/4 x 1 1/4"

Figure 1

Time-Current Characteristics...IEC vs. North American Standards for Fuses

Percent of Fuse Rating	Ampere Range	NORTH AMERICAN UL 198G and CSA C22.2, No. 59				INTERNATIONAL IEC 60127* (International Electrotechnical Commission, Publication 60127*)							
		Fast-Acting		Time-Delay		Sheet I Quick-Acting, High		Sheet II Quick-Acting, Low		Sheet III Time-Lag, Low		Sheet V Time-Lag, High	
		Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.	Min.	Max.
110%	0-30A	Continuous	—	Continuous	—								
135%	0-30A	—	1 hr.	—	1 hr.								
150%	32mA-6.3A	—	—	—	—	1 hr.	—	1 hr.	—	1 hr.	—	1 hr.	—
200%	0-3.0A	—	2 min.	5 sec.	2 min.								
	3.1-30A	—	2 min.	12 sec.	2 min.								
210%	32mA-6.3A					—	30 min.	—	30 min.	—	2 min.	—	30 min.
275%	32mA-3.9A					.01 sec.	2 sec.	—	—	—	—		
	4A-6.3A					.01 sec.	3 sec.	—	—	—	—		
	32-100mA					—	—	.01 sec.	.5 sec.	.2 sec.	10 sec.		
	125mA-6.3A					—	—	.05 sec.	2 sec.	.6 sec.	10 sec.		
	1A-3.15A											1 sec.	80 sec.
	3.15A-6.3A											1 sec.	80 sec.
400%	32-100mA					.003 sec.	.3 sec.	.003 sec.	.1 sec.	.04 sec.	3 sec.		
	125mA-6.3A					.003 sec.	.3 sec.	.01 sec.	.3 sec.	.15 sec.	3 sec.		
	1A-3.15A											95 ms.	5 sec.
	3.15A-6.3A											150 sec.	5 sec.
1000%	32-100mA					—	.02 sec.	—	.02 sec.	.01 sec.	.3 sec		
	125mA-6.3A					—	.02 sec.	—	.02 sec.	.02 sec.	.3 sec.		
	1A-3.15A											10 ms.	100 ms.
	3.15A-6.3A											20 ms.	100 ms.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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and 5 x 20mm fuse types should be considered as two separate components for specification purposes.

A final major difference between North American and international fuses is their breaking capacity (Figure 2). This is the ability of the fuse to clear a fault condition without being destroyed in the process, expressed in amperes. Because fuses used in products that will be shipped internationally will be operating at higher voltages than they would in North America, the breaking capacity ratings are considerably different.

The low breaking capacity IEC 60127* fuse is normally constructed with two plated brass end caps and a clear glass tube surrounding the fuse link itself. This construction is almost identical to that used on the common North American 1/4 x 1 1/4" fuse. The high breaking capacity IEC 60127* fuse, however, is always sand-filled. The insulating tube may be made of clear glass or a ceramic material at the manufacturer's option.

Approval Requirements

The North American fuses in this catalog are covered by the Underwriters Laboratories listing or component recognition program. Those fuses that have been manufactured to UL 198G are tested to that standard. The .RU or UL mark must appear on the recognized fuse. Similarly, the Canadian Standards Association tests and certifies fuses that have been made to C22.2, No. 59. The SP mark must appear on certified fuses.

SEMKO (Sweden) is the only major test agency that requires that IEC 60127* fuses themselves be tested. SEMKO requirements are completely in accordance with IEC 60127*. All SEMKO approved fuses carry the S mark which is usually embossed on the side or end of one of the fuse caps. VDE and other national agencies require only that fuses conform to IEC 60127* or a national equivalent specification (e.g., DIN 41660). Assuming that the manufacturer's objective is to make one product for sale worldwide, we recommend that 5 x 20mm fuses be specified with SEMKO approval. For the sake of completeness, the component specification should require conformance to IEC 60127*.

Steps in Specifying Fuses

The basic objectives in specifying a fuse are as follows:

- Protect the operator.
- Protect the equipment.
- Avoid nuisance opening.

The fuse specification process normally involves the following steps:

1. Based upon the surge current characteristic of the product, choose the correct type of fuse.
2. Pick a fuse with a current rating that is appropriate for the full load (RMS amperes) characteristic of the product.
3. Choose a fuse with a voltage rating that matches or exceeds the line voltage that it will see.
4. Make sure that the breaking capacity of the fuse equals or exceeds the

specifying fuses. If the product includes motors, transformers, incandescent lamps and capacitive loads, then transient surges must be considered. Figure 3 illustrates the surge current characteristic of a typical product as it is turned on. Note that the maximum current drawn during the first 1-4 cycles will normally range from 4-20 times the rated current for products operating at 120VAC. The surge current multiplier on the same product can be significantly greater at 240VAC. The reason is that the transformer primary on a product designed to operate at 240 volts has more turns than one at 120 volts. Since each turn has a certain amount of capacitance, increasing the number of turns also increases the total interwinding capacity characteristic of the primary winding of the transformer. It is this additional capacitance that creates the larger surge current characteristic in a product operating at 240 volts in comparison to one that operates at only 120 volts.

In-rush currents can require Fast-Acting (North American) or Quick-Acting (IEC 60127*) fuses to be sized from 1.5 to 3.0 times full load current. Even after applying this rule of thumb, surge currents may still cause nuisance openings. Time-Delay (North American) or Time-Lag (IEC 60127*) fuses are more appropriate in this situation. With these types, a fuse rating that is 1.25 to 1.5 times full load current should be adequate to avoid nuisance openings. In this case, the Time-Delay or Time-Lag fuse gives the product more protection because its rating can be closer to the full load current. For products with surge

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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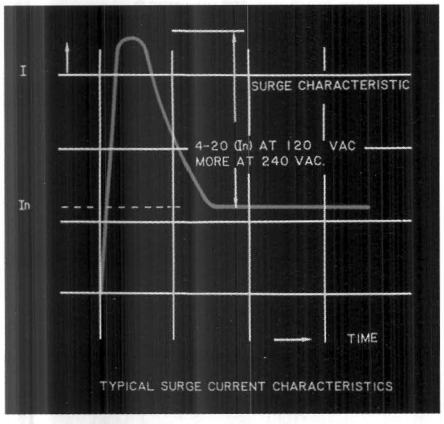

Figure 3
Surge current characteristics

currents that are 10 times the full load current during the first 10 msec of operation, use Fast-Acting or Quick-Acting fuses. They provide a higher level of protection.

To verify that fuse performance matches known start-up conditions, use the "time-current" graphs that appear in the fuse data boxes starting on page 216. These graphs allow you to make the most precise selection of fuse type and current rating for your application.

2. Current Rating Selection

Components such as semiconductors, resistors, transformers, or heaters can overheat dangerously. Use the manufacturer's specified overload current to determine this value experimentally. The selected fuse value must be lower than the lowest overload current of the components in your product. Choose this value from the chart for the fuse type determined in step 1 on the previous page.

The nominal current rating of a product in RMS amperes is a reflection of the amount of current drawn by the product after it has been turned on and warmed up and is operating normally. Some products, particularly those with motors that are turned off and on, will draw different amounts of current under different operating conditions. In these cases, it is important to determine what the dynamic current characteristic is so that the full load current can be identified.

Verify that the fuse rating selected is higher (1.25 to 1.5 as a rule of thumb) than the full load current determined in step 1. This will help avoid nuisance openings. Remember that fuses are designed not to open until the circuit current exceeds 110% (North America) to 120% (IEC 60127*) of rated current, times their current rating.

In addition to choosing a fuse value between the component overload current and the product full load current, there are other factors that need to be considered. The clips holding the fuse must exert adequate pressure on the fuse end caps, and there must be good contact area between these surfaces to minimize contact resistance. In addition, the hookup wire to the fuseholder must be sized adequately, and the connections must be clean and tight to minimize resistance that might cause heat buildup in the vicinity of the fuse. Finally, the ambient temperature must be between 21.1° and 26.7° C. If any of the above conditions are less than optimum, choose a fuse with a higher rating than the product's full current rating would indicate.

3. Voltage Rating Selection

The safety agencies have established voltage ratings for the various types of fuses. This rating is not important when the product is operating normally; it comes into play when the fuse tries to open the circuit. The fuse must be capable of keeping the circuit open against the potential of the open-circuit voltage. For this reason, make sure that the fuse voltage rating equals or exceeds the line voltage.

Examples:

Line Voltage	*Fuse Rating*	*Adequate Fuse?*
120	125	Yes
220	125	No
120	250	Yes
240	250	Yes

4. Breaking Capacity Selection

Verify that the specified fuse has greater breaking capacity than the maximum available current that can be supplied to your product. This is an important safety consideration. If the breaking capacity is too low, the fuse could cause damage or injury when clearing a short.

The maximum AC short circuit current that can be delivered by the mains depends upon such things as the rating of the distribution transformer, the size of the conductors and the distance from the transformer to your product.

5. North American and International Fuse Selection

The line voltage in most countries is higher than it is in North America. Your product will then draw less current overseas. For this reason and because IEC and UL/CSA fuse specifications are so different, separate ratings will be required here and abroad. To check the current that your product will draw in each market, find the various national line voltages.

6. Testing Your Selected Fuse

Many variables aren't considered when picking initial fuse values. Think of these first choices as estimates only. After selecting a fuse for your product, obtain samples of these and a few other logical values. Test the samples under all load conditions that are possible. Start and stop the equipment many times to insure that surge current doesn't cause nuisance openings.

After testing, you may find that the final fuse specification may not be the same as the initial one.

Call toll-free (800) 662-2290 to Panel Components Corporation's Customer Service Department to obtain your free sample fuses.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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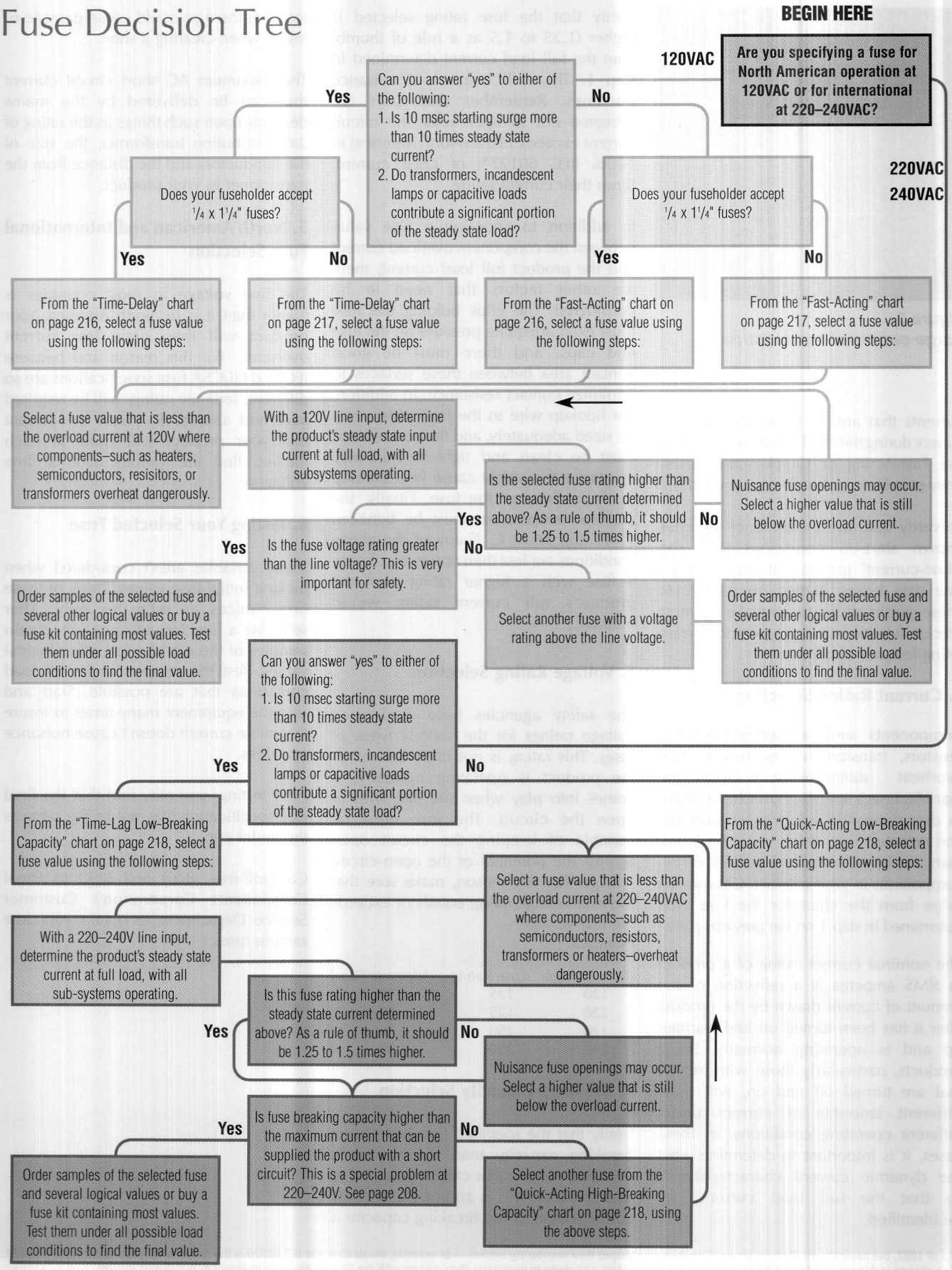
Fuse Decision Tree



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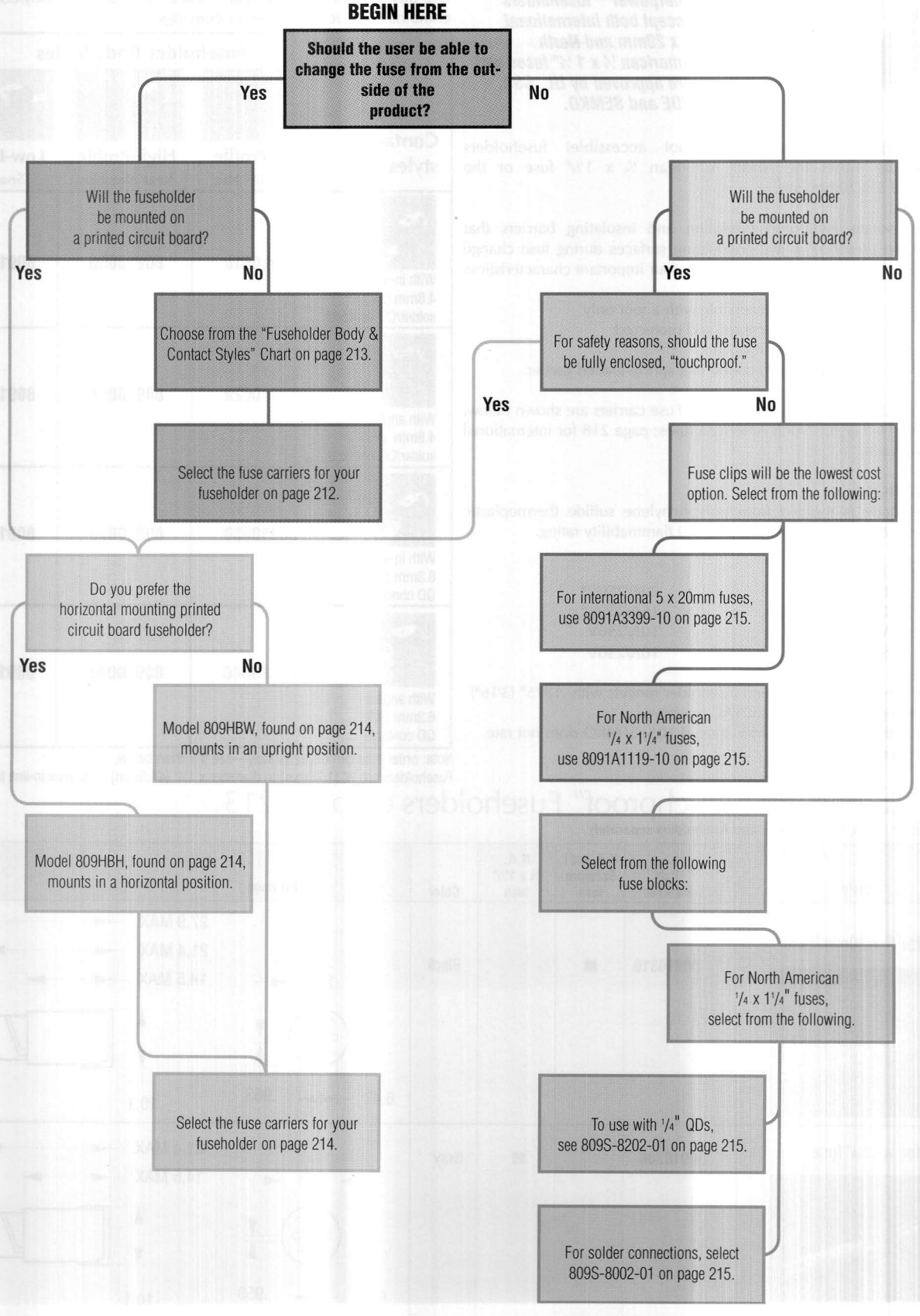
Fuseholder Decision Tree



2. Contacts are recessed and protected.
3. Fuse carrier is insulated.
4. Fuse carrier is retained in a spring-loaded carrier.

Specify fuse carriers and fuses separately. Fuse carriers are shown below. See pages 216-217 for North American fuses; page 218 for international 5 x 20mm fuses.

SPECIFICATIONS:
Materials: Body is molded from polyphenylene sulfide thermoplastic resin; contacts, tin-plated brass. UL 94 V-0 flammability rating.

Approvals & Ratings:

UL recognition	20A/250V*
CSA certification	16A/250V*
VDE	10A/250V
SEMKO**	10A/250V

* Note: We do not recommend fuseholder models with .1875" (3/16") QDs in applications 15A/250VAC or above.

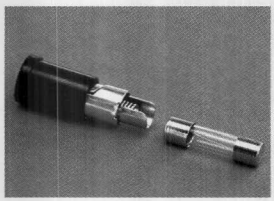
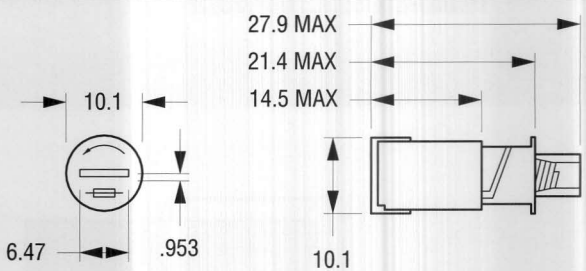
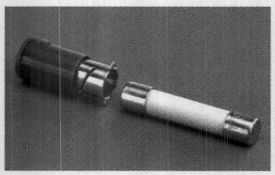
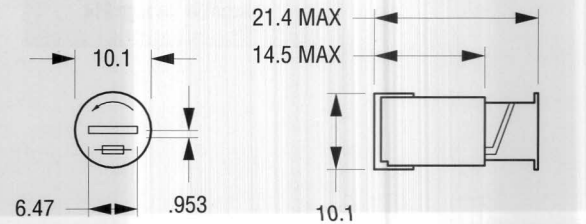
** Note: Although the fuseholder is rated 10A, SEMKO does not rate fuses over 6.3A.

With angled 4.8mm (3/16") solder/QD contacts	**80910020**	**80910060**	**80910100**
With in-line 6.3mm (1/4") QD contacts	**80910030**	**80910070**	**80910110**
With angled 6.3mm (1/4") QD contacts	**80910040**	**80910080**	**80910120**

Note: order fuse carriers separately—see the chart below.
Fuseholders are 5/8" (15.9mm) in diameter x 1 3/4" (44.5mm) long, plus in-line terminal.

Fuse Carriers for "Touchproof" Fuseholders on page 213.

Note: specify fuses, fuse carriers, and fuseholders separately.

Style	Part Number	N.A./Int'l 5x20mm fuse	N.A. 1/4 x 1 1/4" fuse	Color	Drawings
Carrier for 5 x 20mm fuse 	**80910310**	■		Black	
Carrier for 1/4 x 1 1/4" fuse 	**80910300**		■	Gray	

Dimensions are in mm

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International "Touchproof" Fuseholders, cont.

Note: specify fuses, fuse carriers, and fuseholders separately.

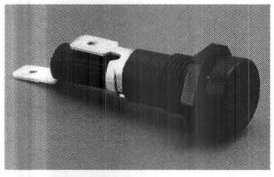
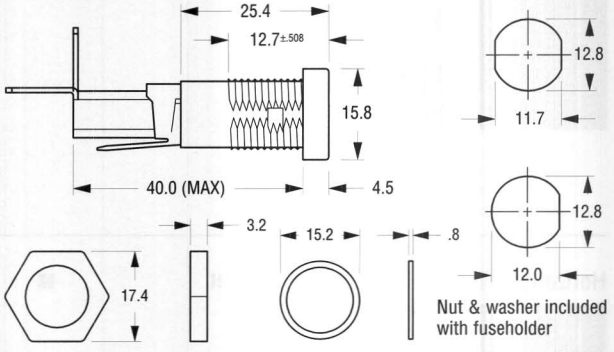
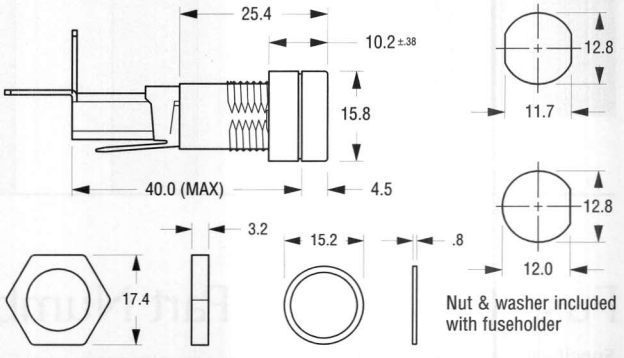
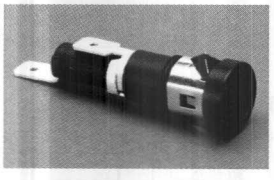
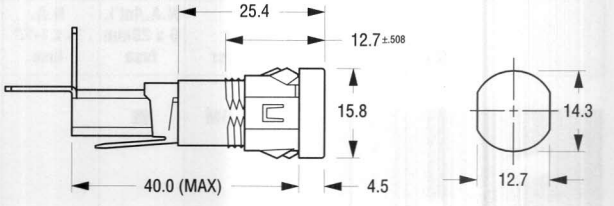
Nuts are included with fuseholder body (except for snap-in model which does not require nut or washer).

Materials: Body is molded from polyphenylene sulfide thermoplastic resin; contacts, tin-plated brass. UL 94 V-0 flammability rating.

Markings: All parts are marked "80910."

Approvals & Ratings:

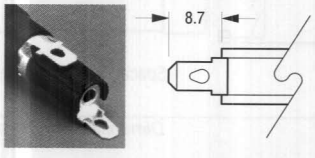
UL recognized	20A/250V
CSA certification	16A/250V
VDE	10A/250V
SEMKO	10A/250V

Style	Part Number	Contact Style	Rating & Approvals	Drawings	Mounting
Low Profile • Rear Hex Nut  Max. Panel Thickness 7.62mm	**80910010**	4.8mm solder/QDs	see above	 Nut & washer included with fuseholder	
	80910020	angled 4.8mm solder/QDs			
	80910030	6.3mm solder/QDs			
	80910040	angled 6.3mm			
High Profile • Rear Hex Nut Max. Panel Thickness 3.18mm	**80910050**	4.8mm solder/QDs	see above	 Nut & washer included with fuseholder	
	80910060	angled 4.8mm solder/QDs			
	80910070	6.3mm solder/QDs			
	80910080	angled 6.3mm solder/QDs			
Low Profile • Snap-in  Max. Panel Thickness 3.18mm	**80910090**	4.8mm solder/QDs	see above		
	80910100	angled 4.8mm solder/QDs			
	80910110	6.3mm solder/QDs			
	80910120	angled 6.3mm solder/QDs			

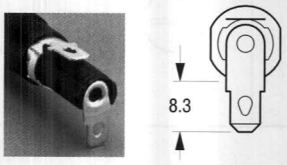
Dimensions are in mm

Contact Styles

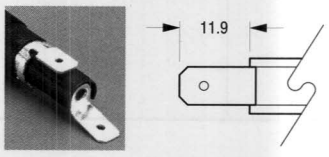
In-line 4.8mm (3/16") solder/QDs



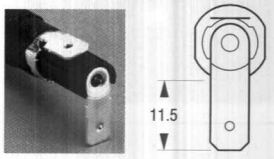
Angled 4.8mm (3/16") solder/QDs



In-line 6.3mm (1/4") QDs



Angled 6.3mm (1/4") QDs



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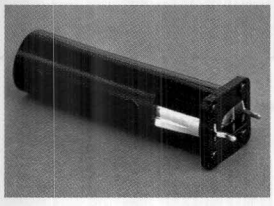
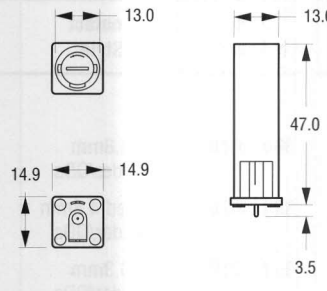
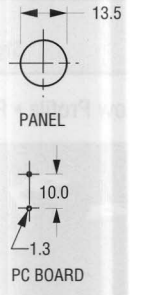
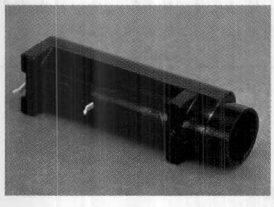
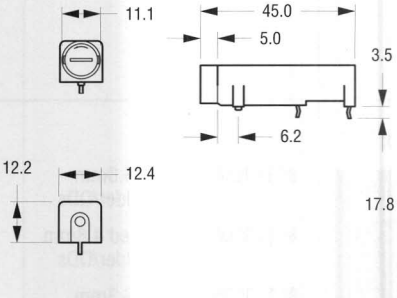
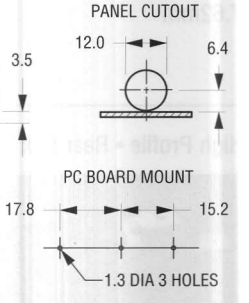
PC-Board Mount Fuseholders

"Touchproof" PC-board mounting fuseholders with fuse carriers for international 5 x 20mm fuse or North American ¼ x 1¼" fuse. (Order fuses and carriers separately; see pages 216-218 for fuses.)

Materials: Body is high dielectric molded phenolic (UL 94 V-1); contacts are copper alloy, tin plated.

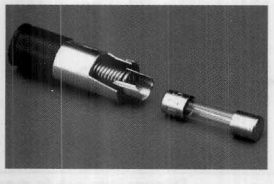
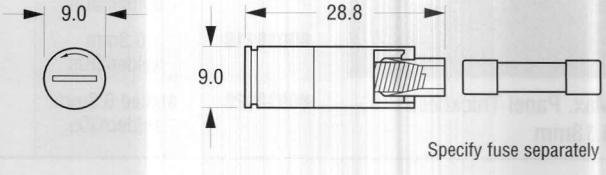
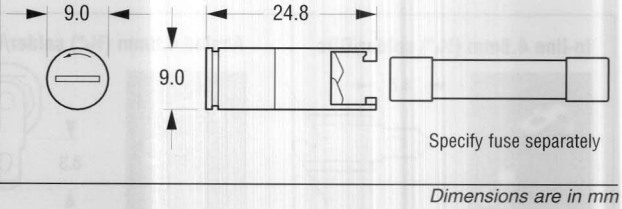
Approvals: UL recog. 12A/250VA; CSA cert. 12A/250VAC; VDE 6.3A/250VAC; SEMKO 6.3A/250VAC.

Style	Part Number	Vertical	Horizontal	Approvals & Rating	Drawings	Mounting
Vertical Mount 	**809HBW**	■		6.3/ 250VAC 12A/ 250VAC		
Horizontal Mount 	**809HBH**		■	6.3/ 250VAC 12A/ 250VAC		

Dimensions are in mm

Fuse Carriers for Part Numbers 809HBW & 809HBH Above

Specify and order separately.

Style	Part Number	N.A./Int'l. 5 x 20mm fuse	N.A. ¼ x 1-¼" fuse	Color	Drawings
	**809FBM**	■		Black	 Specify fuse separately
	809FBI		■	Gray	 Specify fuse separately

Dimensions are in mm

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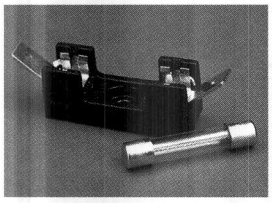
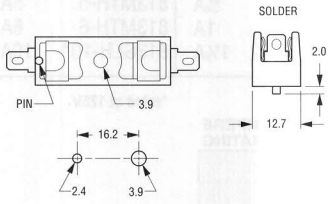
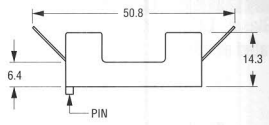
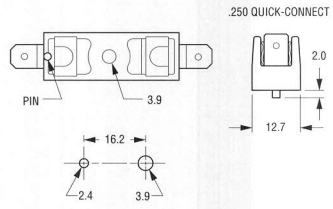
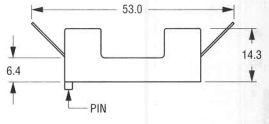
Fuse Blocks (PC-Board Mounting)

Note: VDE does not test or approve fuse blocks because they are not user accessible.

Must be installed in equipment; cannot be user accessible.
Materials: spring bronze; corrosion-resistant albaloy finish.
UL 94 V-0 flammability rating.

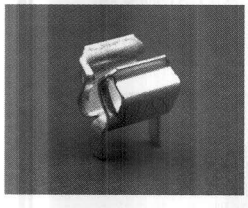
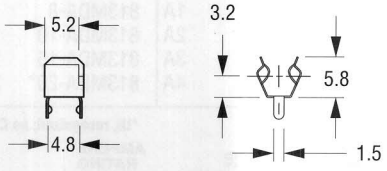
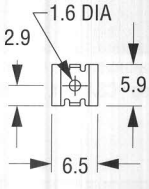
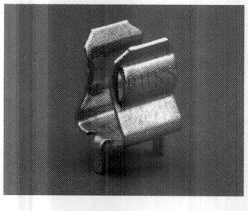
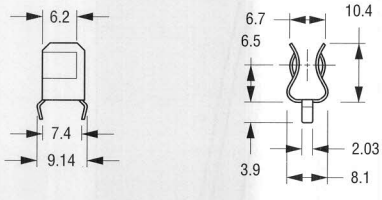
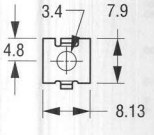
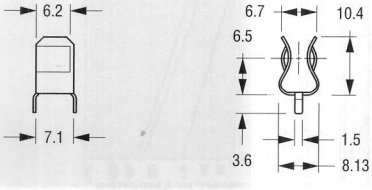
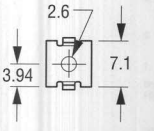
Style	Part Number	Contact Style	For 5 x 20mm Fuse	For ¼ x 1¼" Fuse	Drawings	Mounting
For ¼ x 1¼" fuse  *UL recog., CSA cert.*	**809S-8002-01**	40° angled solder		■		
	809S-8202-01	40° angled 6.3mm QD contacts		■		

Dimensions are in mm

Fuse Clips (with End Stops—PC-Board Mounting)

Must be installed in equipment; cannot be user accessible. Two clips are required to accommodate one fuse. The bent legs stabilize the clip on a PC-board.

Materials: spring bronze; corrosion-resistant bright tin finish.
Approvals: none—the parts below can only be approved as part of final assembly.

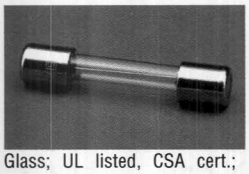
Style	Part Number	Contact Style	For 5 x 20mm Fuse	For ¼ x 1¼" Fuse	Drawings	Mounting
For 5 x 20mm fuse 	**8091A3399-10**	solder pins	■			
For ¼ x 1¼" fuse 	**8091A1119-10**	solder pins		■		
	8091A1907-07	solder pins		■		

Dimensions are in mm

North American 1/4 x 1 1/4" Fuses

Fuses conform to UL 198, CSA C22.2 No. 59.

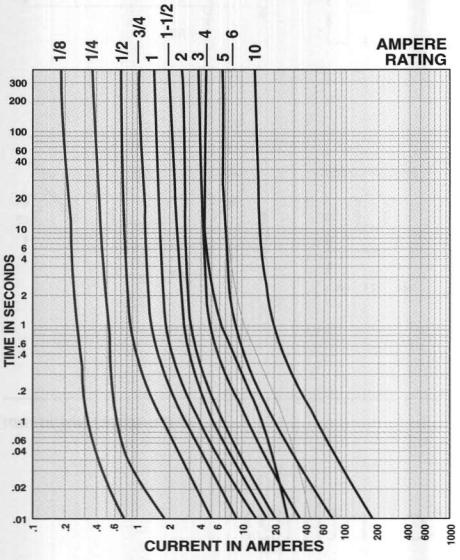
Fast-Acting



Glass; UL listed, CSA cert.; rated at 250V

Part Number	Rated Current I_n	Part Number	Rated Current I_n
813AGC-1/8	1/8A	813AGC-2	2A
813AGC-1/4	1/4A	813AGC-3	3A
813AGC-1/2	1/2A	813MTH-4	4A
813AGC-3/4	3/4A	813MTH-5	5A
813AGC-1	1A	813MTH-6	6A
813AGC-1 1/2	1 1/2A	813GLH-10*	10A

*rated at 125V

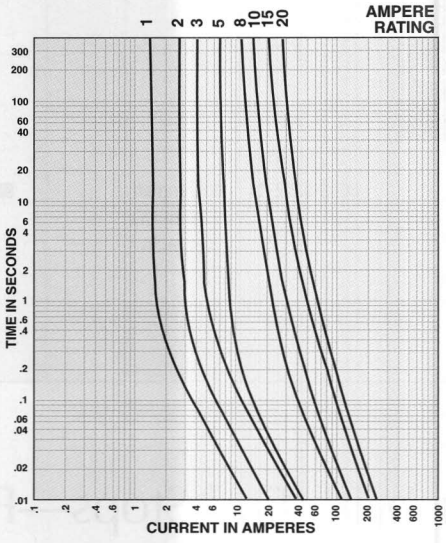


Fast-Acting

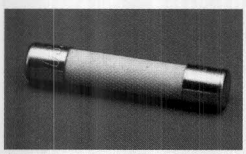
Ceramic/sand; UL listed & CSA cert.; rated at 250V

Part Number	Rated Current I_n	Part Number	Rated Current I_n
813ABC-1/2	1/2A	813ABC-6	6A
813ABC-1	1A	813ABC-8	8A
813ABC-2	2A	813ABC-10	10A
813ABC-3	3A	813ABC-15	15A
813ABC-5	5A	813ABC-20*	20A

*UL recognized; no CSA certification



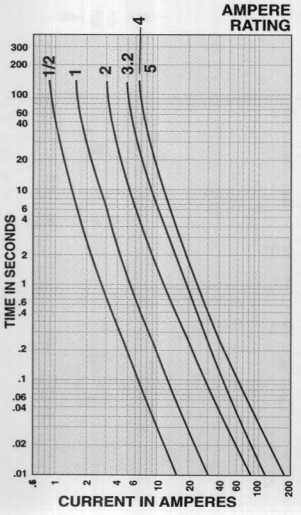
Time-Delay

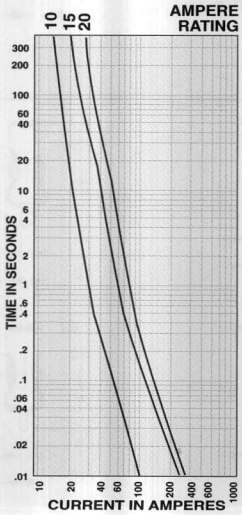


Ceramic/sand; UL listed or recog.; CSA cert.; rated at 250V

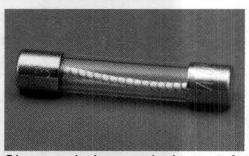
Part Number	Rated Current I_n	Part Number	Rated Current I_n
813MDA-1/2	1/2A	813MDA-5	5A
813MDA-3/4	3/4A	813MDA-7	7A
813MDA-1	1A	813MDA-8	8A
813MDA-2	2A	813MDA-10	10A
813MDA-3	3A	813MDA-15	15A
813MDA-4	4A	813MDA-20*	20A

*UL recognized; no CSA.



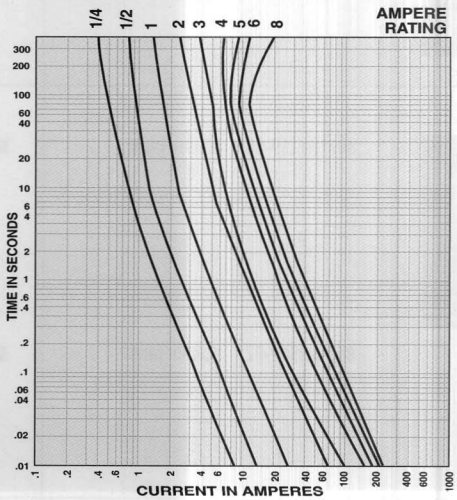


Time-Delay



Glass; spiral wound element for moderate in-rush I_n; UL listed, CSA cert.; rated at 250V.

Part Number	Rated Current I_n	Part Number	Rated Current I_n
813MSL-1/4	1/4A	813MSL-3	3A
813MSL-1/2	1/2A	813MSL-4	4A
813MSL-3/4	3/4A	813MSL-5	5A
813MSL-1	1A	813MSL-6	6A
813MSL-2	2A	813MSL-8	8A



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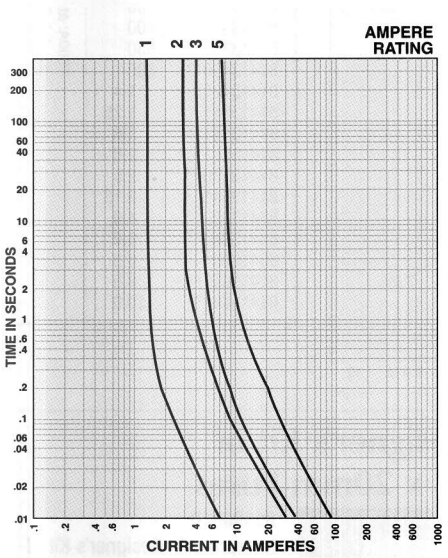
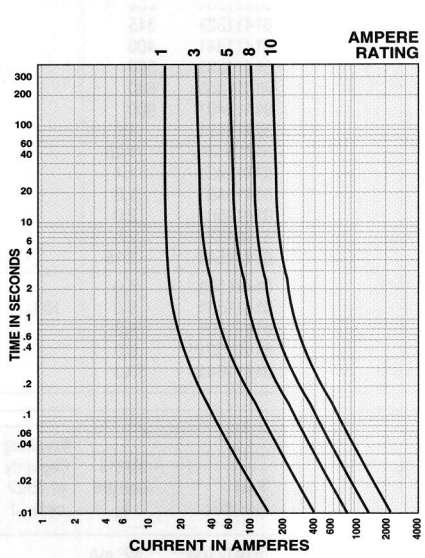
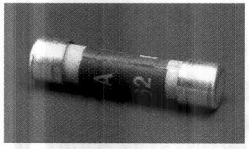
TOLL-FREE (U.S./Can./P.R./V.I.)
Call toll-free: (800) 662-2290
Fax toll-free: (800) 645-5360



UL recognized



United Kingdom BS 1362 Replacement Fuses for United Kingdom Plugs



Part Number	Rated Current	Breaking Capacity
81400590	3 amps	6000A/250V
81400790	5 amps	6000A/250V
81400990	10 amps	6000A/250V
81400890	13 amps	6000A/250V

Note: Rewirable United Kingdom plugs on standard Panel Components Corporation's United Kingdom cordsets carry a 13 amp BS 1362 fuse. The fuses shown above can be used as replacements. (These fuses are only used in United Kingdom plugs and are a unique size: they are 25.4mm long as opposed to the North American fuse which is 1¼" long, and the international fuse which, at 20mm, is approximately ¾" long.)

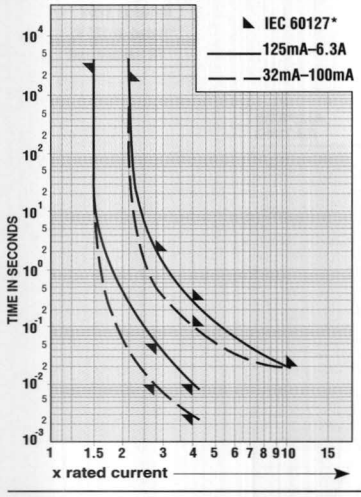
* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Interpower™ International 5 x 20mm Fuses

Interpower™ 5 x 20mm fuses conform to IEC 60127*; most have been tested and approved by SEMKO and carry the SEMKO test mark.††
All fuses are rated at 250VAC. Minimum order: 1 box (10 fuses)

Quick-Acting Low-Breaking Capacity

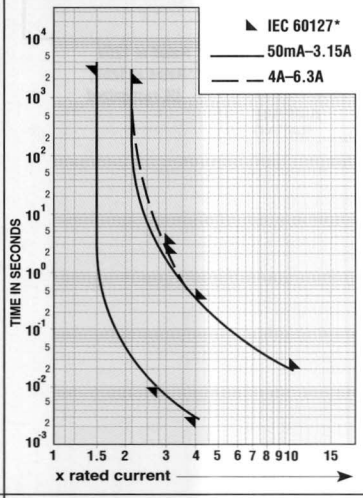
to IEC 60127*, std. sheet II; DIN 41661;
SEMKO 104-1976; glass tube



Part Number	Rated Current I_n	Breaking Capacity at 250V cosϕ 1
81411101	32† mA	
81411120**	40	
81411140**	50	
81411160**	63†	
81411181	71	
81411200**	80	
81411221	100	35 A
81411241	125	
81411261	160	
81411281	200	
81411301	250	
81411321	315	
81411341	400	
81411361	500	
81411381	630	
81411401	800	
81411421	1.A	
81411441	1.25	
81411461	1.4	
81411481	1.6	
81411501	2.0	
81411521	2.5	
81411541	3.15	
81411561	4.0	
81411581	5 0	10 I_n
81411601	6.3	
81411621††	8.0	
81411641††	10.0	

Quick-Acting High-Breaking Capacity

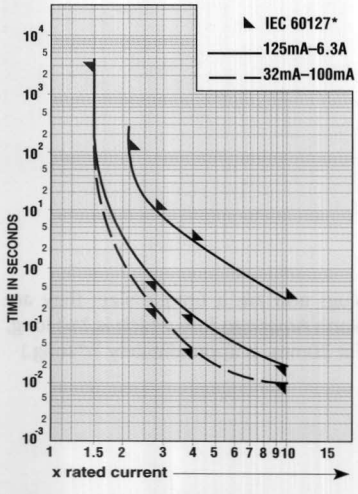
to IEC 60127*, std. sheet I; DIN 41660;
SEMKO 104-1976; ceramic, sand



Part Number	Rated Current I_n	Breaking Capacity
81413140**	50† mA	1500A: at 250V, 50Hz, cosϕ0.7-0.8
81413160**	63†	
81413180**	71	
81413200**	80	
81413220**	100	
81413240**	120	
81413260**	160	
81413280**	200	
81413300**	250	
81413320**	315	
81413340**	400	
81413360**	500	
81413380**	630	
81413400**	800	
81413421	1.A	
81413441	1.25	
81413481	1.6	
81413501	2.0	
81413520**	2.5	
81413541	3.15	
81413560**	4.0	
81413580**	5.0	
81413601	6.3	
81413621††	8.0	
81413641††	10.0	

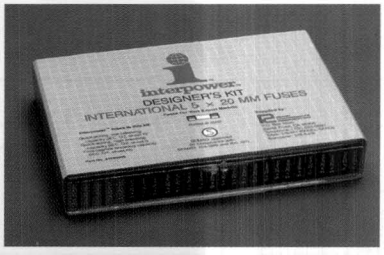
Time-Lag Low-Breaking Capacity

to IEC 60127*, std. sheet III; DIN 41662;
SEMKO 104-1976; glass tube



Part Number	Rated Current I_n	Breaking Capacity at 250V cosϕ 1
81412100**	32† mA	
81412120**	40†	
81412140**	50	
81412161	63	
81412181	71	
81412200**	80	
81412221	100	
81412241	125	
81412261	160	
81412281	200	
81412301	250	
81412321	315	35 A
81412341	400	
81412361	500	
81412381	630	
81412401	800	
81412421	1.A	
81412441	1.25	
81412461†	1.4	
81412481	1.6	
81412501	2.0	
81412521	2.5	
81412541	3.15	
81412561	4.0	
81412581	5.0	10 I_n
81412601	6.3	
81412621††	8.0	
81412641††	10.0	

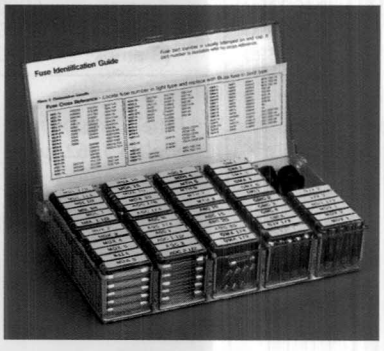
Interpower™ Designer's Kit of International 5 x 20mm Fuses



81490010
Interpower™ Designer's Kit of International 5 x 20mm fuses contains 52 ten-pack boxes of the Interpower™ fuses.

See page 222 for more information.

Designer's Kit of North American ¼ x 1¼" Fuses and UL/CSA 5 x 20mm fuses



81490020
Kit contains a total of 270 fuses and fuse accessories.

Included are standard ¼ x 1¼" North American fuses and UL/CSA 5 x 20mm fuses.

† Not included in applicable standards.

†† Note: the 5 x 20mm 8A & 10A fuses are not included in IEC 60127* sheet style I, II, III, and do not carry SEMKO approval.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

** Special Order

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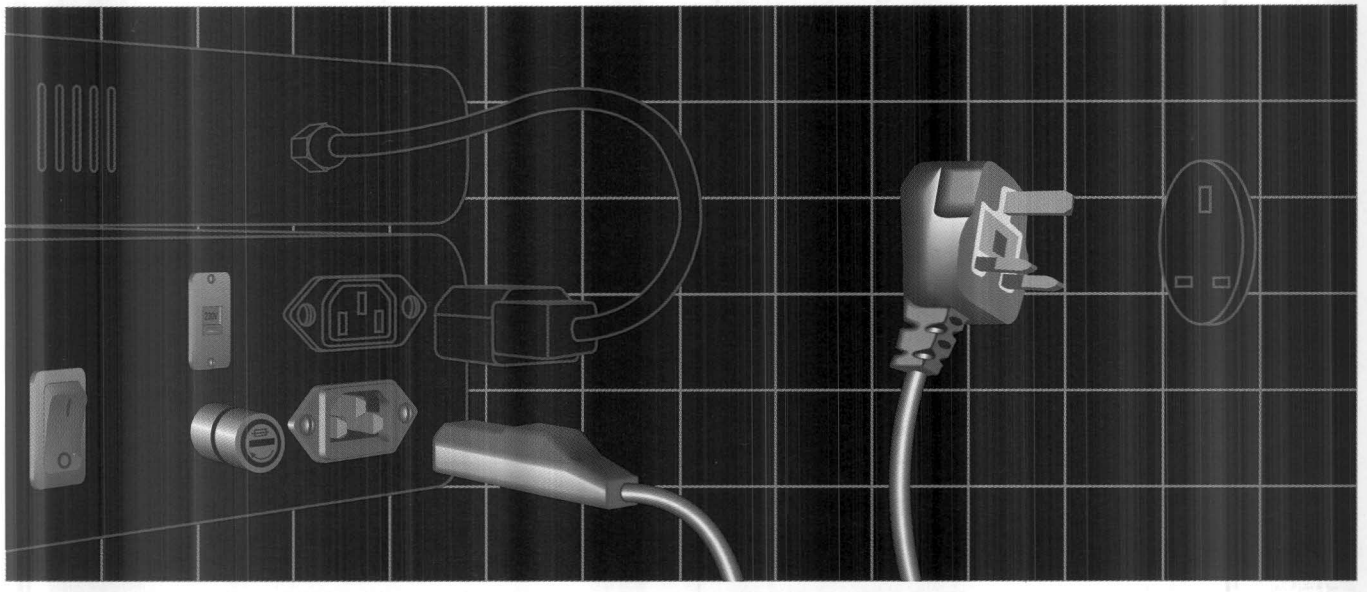
Kits & Panels



Designer's Kits

We have packaged together nine international cordsets, nine international sockets, and nine international plugs into three convenient Designer's Kits. We also offer a Designer's Kit of 5x20mm fuses and a kit of North American fuses.

Designer's Panels (Free on Request!)

If you are working on a project which will require a power entry module, IEC 60320* power inlet and/or a cordset connector lock (to secure the cordset to the IEC 60320* inlet), call our Customer Service Department at (800) 662-2290 for the free Designer's Panels which appear on page 223.

Interpower™ North American Cordsets Sample panel

The free sample panel includes North American cords terminated with five different styles of IEC 60320* connectors. Cordsets are displayed and labeled for easy ordering of North American cordsets. Interpower™ cordsets come in a variety of standard lengths and colors.

Color Chip Sample Box (Free on Request!)

We also offer a free sample box with seven different color chips inside which represent standard Panel Components Corporation colors (Part number 55050170). We can also try to color match our custom cordsets to your products and equipment.

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

Interpower™ Designer's Kit of International Cordsets

Size: 483mm x 394mm x 102mm

Weight: approx. 4kg

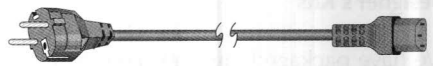
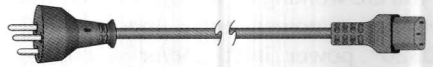
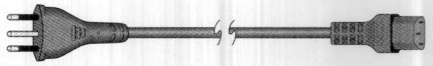
Delivery: from stock

Features:

- **Nine cordsets with the most common international plugs; each cordset is terminated with the IEC 60320* appliance connector, a common standard in the industrialized world.**
- **Complete specs on each cordset for use in developing your purchasing specifications. Each spec includes:**
  1) a general description of the cordset;
  2) applicable international standards;
  3) required safety agency approvals;
  4) mechanical specifications on cordage, plugs, and IEC 60320* connectors;
  5) electrical rating;
  6) outline and dimensioned drawings of each cordset.
- **Information on world plug and socket standards, world electrical voltages and frequencies, and design information as detailed in Panel Components Corporation's publications.**

† We reserve the right to substitute part numbers to reflect product changes; substitution is sometimes necessary to update product approvals or to change manufacturers to improve delivery times.

The Designer's Kit includes these cordsets:

	Country	Part No.†	Rating	
A	Continental Europe	86230030	10A 250V	
B	Australia, New Zealand	86210030	10A 250V	
C	U.K. Ireland	86397010	10A 250V	
D	Denmark	86391000	10A 250V	
E	India, South Africa	86392000	10A 250V	
F	Israel	86393000	10A 250V	
G	Italy	86394000	10A 250V	
H	N.A.	70401020244	10A 125V	
I	Switzerland	86396000	10A 250V	

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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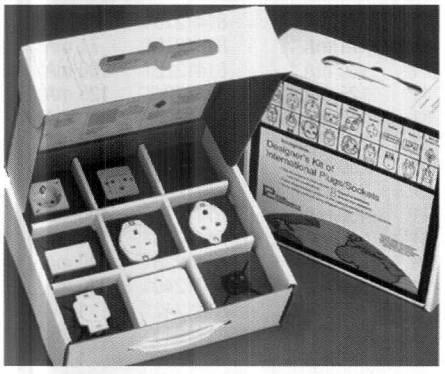
Designer's Kits of International Plugs/Sockets



88090030: Interpower™ Designer's Kit of INTERNATIONAL SOCKETS*

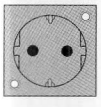
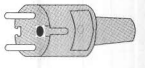
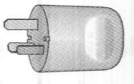
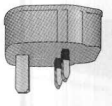
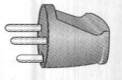
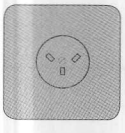
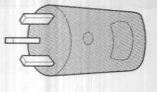
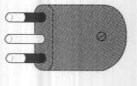
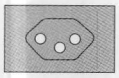
FEATURES:

- Nine conveniently packaged international sockets (or nine international plugs) commonly used worldwide.
- Use sockets and plugs when designing electrical and electronic equipment that will be exported with foreign power cords and cordsets.
- Use sockets in test and burn-in setups.

For a listing of where these plugs and sockets are used, see fold-out poster in the Designer's Reference Section.

Size: 30.5cm x 32cm x 10cm
Weight: approx. 1kg

88090020: Interpower™ Designer's Kit of INTERNATIONAL PLUGS*

Sockets included in the Socket Kit				Plugs included in the Plug Kit		
	Part Number	Page No.	Country	Part Number	Page No.	
	88010610	91	A Continental Europe	88010801	90	
	88010512	93	C Australia/ New Zealand	88010713	94	
	88010621	113	D United Kingdom/ Ireland	88040011	113	
	88010541	95	E Denmark	88010741	95	
	88010561	96	G India	88010763	96	
	88010580	96	H Israel	88010780	96	
	88010572	97	I Italy	88010771	97	
	88010530	112	L Switzerland	88010732	112	
	88010641	110	K North America (NEMA 5-15)	88030100	98	

* Panel Components reserves the right to substitute part numbers to reflect product changes; substitution is sometimes necessary to update product approvals or to change manufacturers to improve delivery times.

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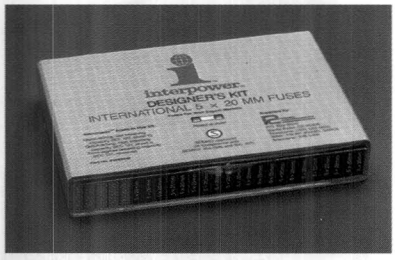
Interpower™ Designer's Kit of International 5 x 20mm Fuses



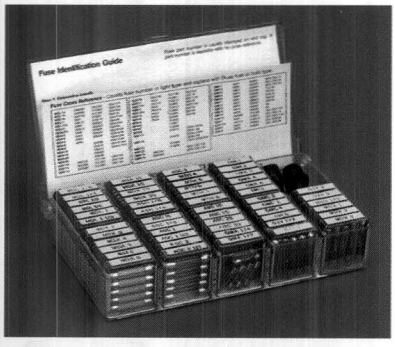
81490010: Interpower™ Designer's Kit of International 5 x 20mm fuses contains 52 ten-pack boxes of the Interpower™ fuses.

See page 218 for performance characteristics.

QUICK-ACTING, HIGH-BREAKING (IEC 60127*/SHEET I)		QUICK-ACTING LOW-BREAKING (IEC 60127*/SHEET II)		TIME-LAG LOW-BREAKING (IEC 60127*/SHEET III)	
81413421	1.0 A	81411101	32 mA	81412161	63 mA
81413481	1.6 A	81411181	71 mA	81412181	71 mA
81413501	2.0 A	81411221	100 mA	81412221	100 mA
81413541	3.15 A	81411241	125 mA	81412241	125 mA
81413601	6.3 A	81411261	160 mA	81412261	160 mA
		81411281	200 mA	81412281	200 mA
		81411301*	250 mA	81412301	250 mA
		81411321	315 mA	81412321	315 mA
		81411341	400 mA	81412341	400 mA
		81411361*	500 mA	81412361	500 mA
		81411381	630 mA	81412381	630 mA
		81411401	800 mA	81412401	800 mA
		81411421*	1.0 A	81412421	1.0 A
		81411441	1.25 A	81412441	1.25 A
		81411461	1.4 A	81412481	1.6 A
		81411481	1.6 A	81412501	2.0 A
		81411501*	2.0 A	81412521	2.5 A
		81411521	2.5 A	81412541	3.15 A
		81411541	3.15 A	81412561	4.0 A
		81411561	4.0 A	81412581	5.0 A
				81412601	6.3 A

* 2 ten-pack boxes of this value in the fuse kit

Designer's Kit of North American ¼ x 1-¼" Fuses and UL/CSA 5x20mm fuses



81490020: Kit contains a total of 270 fuses and fuse accessories.

Included are standard ¼ x 1¼" North American fuses and UL/CSA 5 x 20mm fuses.

¼ x 1¼" fuses (see page 216)		5 x 20mm fuses (see page 218)	
813AGC-1/8	⅛A	813GMA-1/4	¼A
813AGC-3/4	¾A	813GMA-1/2	½A
813AGC-1	1 A	813GMA-1	1 A
813AGC-1-1/2	1-½A	813GMA-2	2 A
813AGC-3	3 A	813GMA-3	3 A
813MTH-4	4 A	813GMA-6	6 A**
813MTH-5	5 A	813GMC-1	1 A
813MTH-6	6 A	813GMC-2	2 A
813MDA-8	8 A	813GMC-3	3 A
813MDA-10	10 A	813GMC-4	4 A**
813MDA-15	15 A	813GMC-6	6 A
813MDA-20	20 A		
813ABC-10	10 A	** Rated at 125V	
813ABC-15	15 A		
813ABC-20	20 A		

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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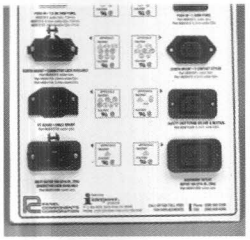
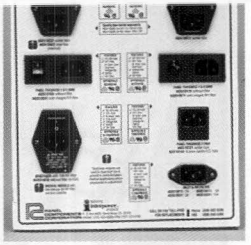


Request: 83010010 Designer's Panel of Inlets & Accessory Connectors

This panel includes the following parts:

Part Number	See page
IEC 60320* INLETS:	
8301312 (or 8301311**)	190
8301213 (or 8301211**)	190
83011172	190
83011340	194
CONNECTOR LOCKS:	
85910010 (or 85910040**)	70
85910051 (or 85910070**)	70
ACCESSORY OUTLETS:	
8301512 (or 8301511**)	198
8301612 (or 8301611**)	198
83011220	198
83011350	200



Request: 83111010 Designer's Panel of Power Entry Modules

This panel includes the following parts:

Part Number	See page
83110032 (or 83110022**)	178
83110011	179
83510160 (or 83510031**)	176
83510170 (or 83510071**)	177
83511420	173
83110121 (or 83110141)	182
83510412 (or other filtered module on page 136**)	187

Request: 83010020 Designer's Panel of Connector Locks for 10A Cordsets

Connector Locks for 10A Rated Cordsets

This panel includes the following:

Part Number	See page
8301211(or 8301213)	190
85910010	70
85910020	70

Note: Connector locks are designed to fit molding of specific cordsets.

Request: 83010030 Designer's Panel of Connector Locks for 16A Cordsets

Connector Locks for 16-20A Rated Cordsets

This panel includes the following:

Part Number	See page
83011340	194
85910051	70
85910040	70
83011380	194

Note: Connector locks are designed to fit molding of specific cordsets.

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** If you require a specific model or contact style; please check with our Customer Service Department; if the part you need is not included on the panel, we can sample you separately.

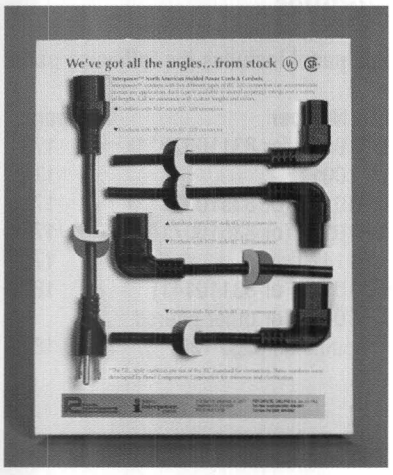
We've got all the angles. . . from stock

Interpower™ North American Molded Power Cords & Cordsets.

Interpower cordsets with five different styles of IEC 60320* connectors can accommodate almost any application. Each type is available in several amperage ratings and a variety of lengths. Call for assistance with custom lengths and colors. Call (800) 662-2290 and ask for the Interpower™ North American Molded Power Cords & Cordsets sample panel.

Features:

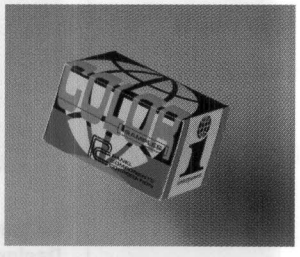
- Samples of all five angled connectors offered from stock.
- All samples are clearly labeled with their angle for easy ordering. For more information on Panel Components Corporation's designation of connectors see page 72-73.



More Color

Interpower™ Color Chips

North American Interpower cordsets are available in custom colors. Call for a free sample box of our color chips (part number 55050170).



Features:

- Seven standard color chips
- Upon request other custom colors can be added
- All color chips display both a textured and smooth finish.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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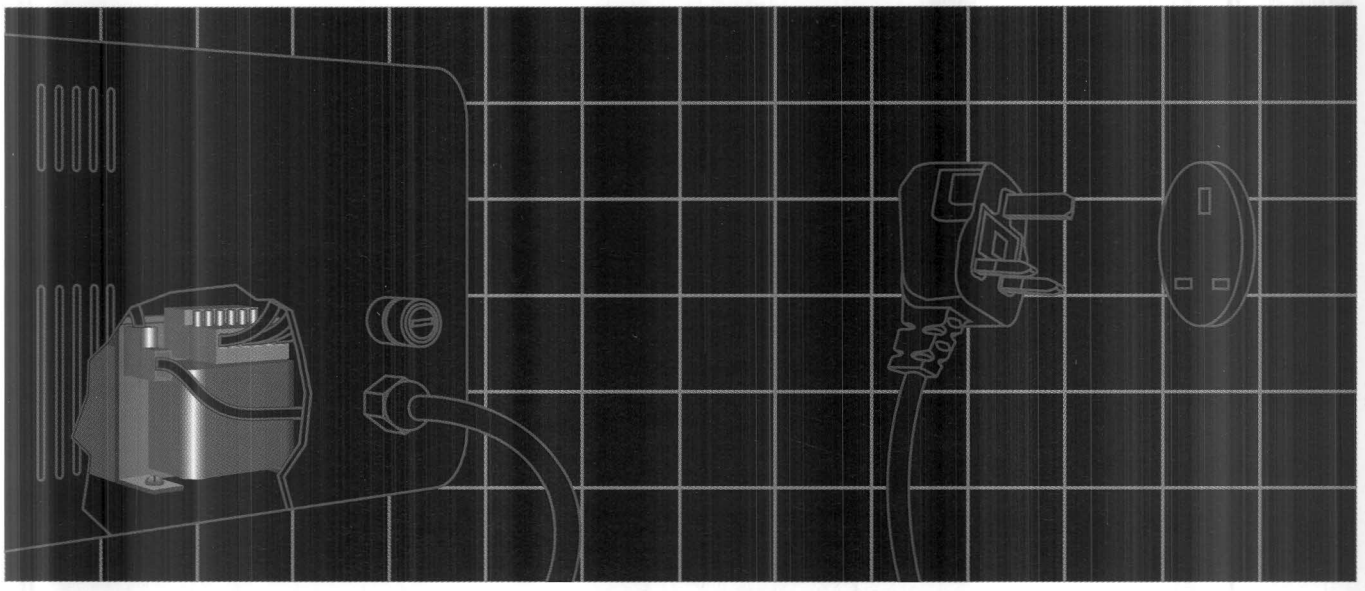
Transformers and Power Supplies



Transformers

Electrical and electronic products are most efficiently produced for both domestic and international markets when they are designed as global products right from the beginning. In some cases, however, this is not an alternative because:

- A decision to export is made after the product was designed for North American markets and a redesign is not warranted or possible.
- Export volume is very small relative to total production.
- Limited engineering capacity prevents an immediate redesign for international power requirements.
- The product is mature and redesign for international markets is not currently justified.

In these situations, a transformer or packaged voltage changer combined with an appropriate foreign cord or cordset, circuit protector, and related components, may be an attractive alternative to a complete redesign of the product's power section. The transformer can be mounted in a separate enclosure or inside the product, if the product has space for additional components. The packaged voltage changer is best in applications in which it will be external to the equipment on which it is being used. Because the packaged voltage changer includes a power switch, circuit protection, a voltage selector, and integral power input connector, it is also most appropriate where an immediate solution is needed.

It is essential to assure in advance that all components in the power section of the load are rated for 50Hz service. This applies particularly to motors, fans, linear power supplies, and other transformers. The transformers and voltage changer in this section are all rated for both 50 and 60Hz service.

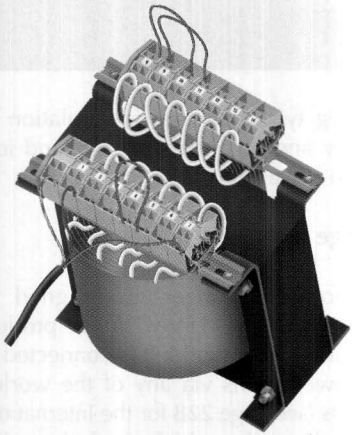
Please note that Panel Components Corporation's transformers are safety isolating types that provide isolation of primary and secondary circuits and low ground leakage current.

Voltage Changer

The voltage changer is designed to accompany the 115VAC input product anywhere in the world. It is connected to the power mains via any of the world's cordsets (see page 228 for the International Cordset Kit, which includes nine different international cordsets). It converts 220VAC power to 115VAC but does **not** change frequency. Therefore, if the input frequency is 50Hz, the output frequency will also be 50Hz. The output is delivered through a standard North American NEMA 5-15R socket.

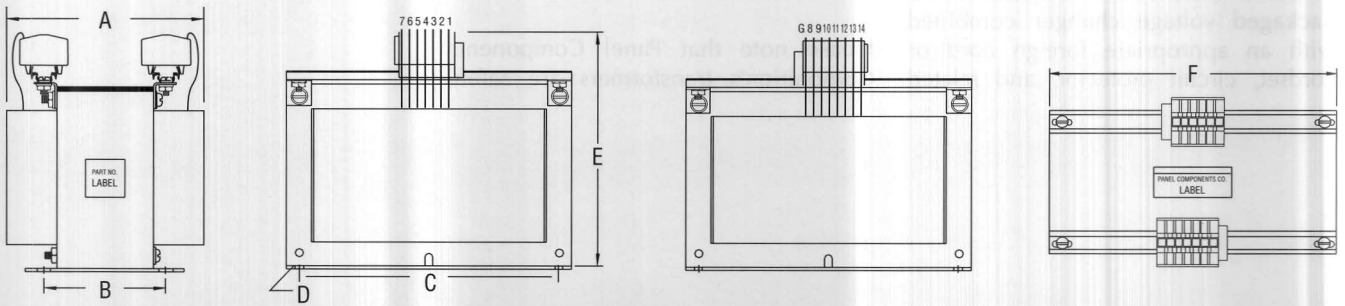
successfully at both 50 and 60 Hz. Foreign power mains are normally 50 Hz systems.

are designed for full rated use at either 50 or 60 Hz.



Input Options	Output Options
100V	100V
120V	120V
200V	200V
220V	220V
230V	230V
240V	240V

Part No.	Voltage	DIMENSIONS (in mm)						
		A	B	C	D	E	F	Weight
82520010	100VA	117.4	88.9	79.3	5.1 x 8.7 slot (4 places)	113 REF.	95.2	3.5kg
82520020	500VA	133.3	79.3	134.9	7.9 x 14.2 slot (4 places)	167 REF.	161.9	10.1kg
82520030	1000VA	175.5	133.4	158.8	9.5 x 19.1 slot (4 places)	198 REF.	190.5	15.9kg
82520040	2000VA	242.1	158.8	158.8	9.5 x 19.1 slot (4 places)	198 REF.	190.5	28.1kg



Materials and specifications subject to change without notice.

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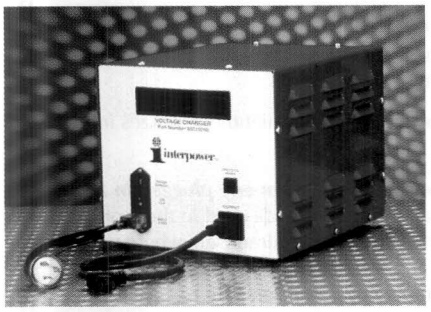
Designing for Export? We make it easy.

100, 500, 1000, & 2000 VA Model Voltage Changers



Interpower™ Voltage Changers, Model 85510250, 85510260, 85510270, 85510280

Interpower™ voltage changers make it easy for equipment manufacturers to adapt their products to work on power mains voltages common in foreign markets. Interpower™ voltage changers are designed only for use on North American manufactured equipment intended for export. They are designed for service on either 50 or 60 Hz circuits.

Generally, when equipment is intended for export, it will be designed right from the beginning to operate on foreign power mains voltages and frequencies. But, some products are intended primarily for domestic markets and are exported in such small quantities, that complete redesign for export is not practical. It is important, however, to verify that all loads used in conjunction with the Interpower™ voltage changer can operate successfully at both 50 and 60 Hz because foreign power mains are normally 50 Hz systems. This is of particular importance with motors, transformers, and solenoids.

Please note that voltage changers do not change frequencies.

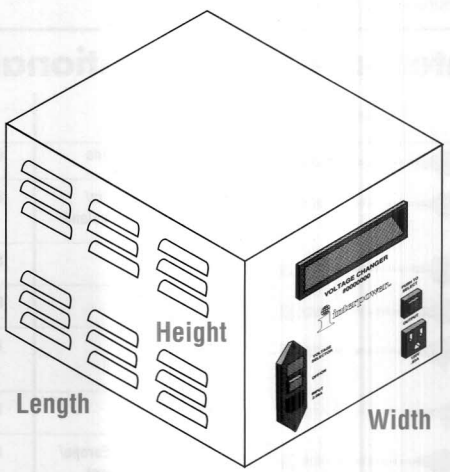
Voltage changers are intended for use with equipment in which an enclosed transformer is desirable. In addition to a transformer, the Interpower™ voltage changer also includes a power entry module with a power switch, a circuit protection device, and an input voltage selector.

Voltage changers from Interpower™ incorporate the isolation transformers described on page 226 of this catalog. These transformers are designed for full rated use at either 50 or 60 Hz and are listed, certified, and approved by UL, CSA, and VDE for use in both information technology and medical applications. Panel Components Corporation is in the process of obtaining CE marking and UL Listing, and CUL certification for our Interpower™ voltage changer product line.

Interpower™ voltage changers are equipped with an IEC 60320* C14 inlet. Panel Components Corporation offers a full range of cordsets with all of the world's plugs and C13 connectors that mate with the C14 inlet.

For more information on cords and cordsets, call (800) 662-2290.

Part No.	Volt-Amps	Length	Width	Height	Weight
85510250	100VA	221.6mm	158.8mm	127.0mm	5.8kg
85510260	500VA	304.0mm	254.0mm	228.6mm	15.0kg
85510270	1000VA	304.0mm	254.0mm	228.6mm	21.1kg
85510280	2000VA	381.0mm	254.0mm	228.6mm	34.5kg



Voltage Changer Instructions

1) Select proper input cord.
2) Select proper input voltage. Do not connect unit to power mains while selector shows wrong voltage. Voltage selector is incorporated with input fuse. To select voltage, disconnect cordset. Remove fuse drawer, pull out bottom fuse holder and position so that proper voltage appears through window in fuse drawer. Replace fuse drawer.
3) If circuit breaker continuously trips, load may be too great. Check power requirements of load.
4) Do not obstruct ventilation openings.
5) Do not open. No user serviceable parts inside.
6) Important — Unit does not change frequency.
7) When necessary, replace input fuse with corresponding rated current value as listed on front of unit.

Input	Output
120V	120V
220V	120V
230V	120V
240V	120V

Materials and specifications subject to change without notice.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

Designer's Kit of International Cordsets

Simplify your power systems design with sample kits from Panel Components Corporation.

86599011:
Interpower™ Designer's Kit of International Cordsets
Size: 483mm x 394mm x 102mm
Weight: approx. 4kg
Delivery: from stock

Note: We reserve the right to substitute part umbers to reflect product changes; substitution is sometimes necessary to update product approvals or to change manufacturers to improve delivery times.

Nine international cordsets are packaged in a convenient, portable box for use by:

- ***Design engineers who configure products for export...*** use these cordsets and the design information included in the kit to configure the electrical system of your product. Complete specifications on each cordset simplify the development of your purchasing specifications.
- ***Engineers who test products prior to shipment overseas...*** the kit conveniently organizes international cordsets for use in your test and burn-in lab.
- ***International travelers who carry and use equipment which must be properly plugged in and grounded...*** the nine cordsets in this kit represent the major plug standards used in the world today. You can plug in and use your computer (or other electrical equipment) almost anywhere where there is a grounded electrical system. (**Note:** world voltages and frequencies vary from country to country; set your equipment at the proper voltage and frequency before operation!)

(Cords and cordsets are also sold individually. See chart below for more information or call our Customer Service Department at 1-800-662-2290.)

Features:

- **Nine cordsets: Continental Europe, Australia/New Zealand, U.K./Ireland, Denmark, India, Israel, Italy, North American, and Switzerland**
- **Each cordset is terminated with the IEC 60320* appliance connector, a common standard in the industrialized world.**
- **Information on world plug and socket standards, world electrical voltages and frequencies, and design information as detailed in Panel Components Corporation's publications.**
- **Complete specs on each cordset for use in developing your purchasing specifications. Each spec includes:**
  1) a general description of the cordset;
  2) applicable international standards;
  3) required safety agency approvals;
  4) mechanical specifications on cordage, plugs, and IEC 60320* connectors;
  5) electrical rating;
  6) outline and dimensioned drawings of each cordset.

Interpower™ International Cordsets for Export Markets

Illustration	Page Number	Country	Part No.	Current Rating	Max. Temp.	Conductor Size	Approvals	Connector lock
	28	**Argentina**	**86390010**	10A/250VAC	70°	3x1.00mm²	IRAM	85910070
	31	**Australia/ New Zealand**	**86210030**	10A/250VAC	75°	3x1.00mm²	SECV	85910070
	34	**China**	**86517040**	10A/250VAC	70°	3x1.00mm²	CCEE	—
	45	**Italy**	**86394000**	10A/250VAC	70°	3x1.00mm²	IMQ	85910070
	63	**U.K./ Ireland**	**86397010**	10A/250VAC	70°	3x1.00mm²	ASTA/BSI	85910070
	42	**Israel**	**86393000**	10A/250VAC	70°	3x1.00mm²	—	85910070
	25	**Cont. Europe/ (German)**	**86230030**	10A/250VAC	70°	3x1.00mm²	OVE, CEBEC, VDE, UTE KEMA, SEMKO, FIMKO, NEMKO, DEMKO, IMQ	85910070
	58	**Russia**	**86513060**	10A/250VAC	70°	3x1.00mm²	–	85910010
	36	**Denmark**	**86391000**	10A/250VAC	70°	3x1.00mm²	DEMKO	85910070
	48	**Japan**	**86589010**	15A/125VAC	60°	3x2.00mm²	Dentori	—
	39	**India/ South Africa**	**86392000**	10A/250VAC	70°	3x1.00mm²	—	85910070
	60	**Switzerland**	**86396000**	10A/250VAC	70°	3x1.00mm²	SEV	85910070
	52	**North America**	**70403020244**	10A/125VAC	60°	3x18AWG	UL, CSA	85910070

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

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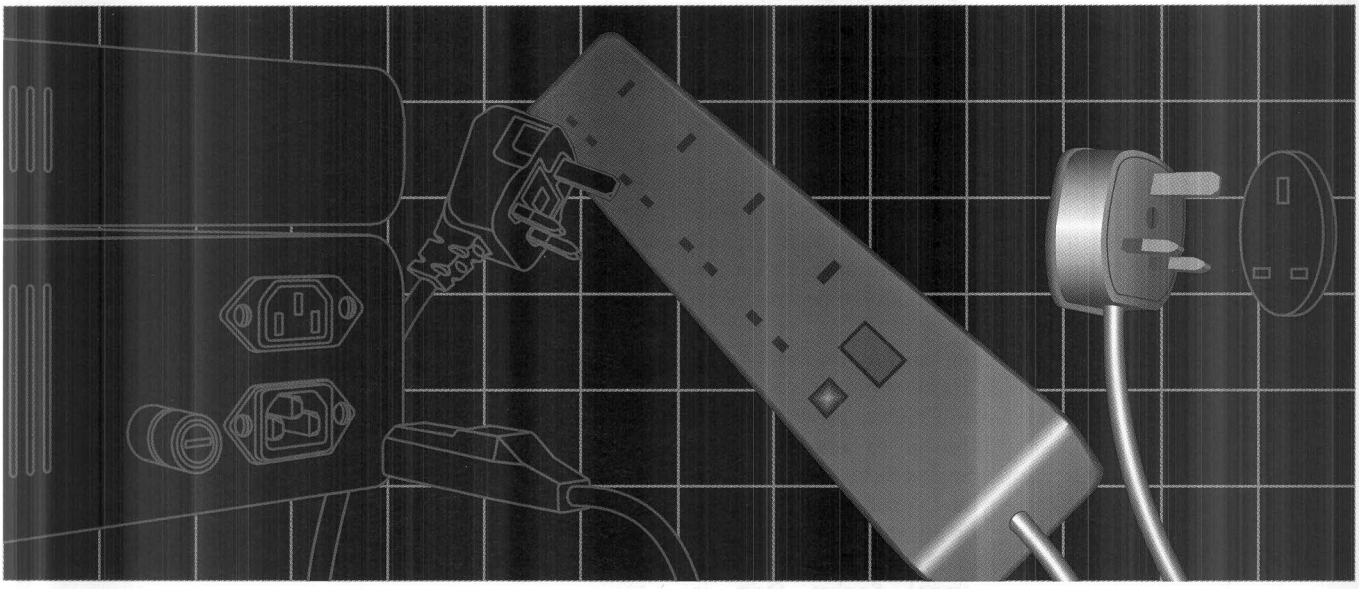
International Socket Strips



Test and Burn-in

Use international socket strips to test or burn-in electrical and electronic equipment that will be exported with foreign power cords and cordsets. Socket strips are particularly useful in this application if several pieces of equipment will be tested at the same time. This allows testing of the equipment, complete with the power cord, in the exact same manner that the foreign customer will use it.

The International Socket Strip shown on pages 230-231 combines several major international sockets into one device and can be connected to a test bench or burn-in rack that has a source of 50Hz power to deliver power to the most commonly used international sockets.* To test your product, just install the correct international power cord into your product and connect it to the proper socket.

The socket strips available from Panel Components Corporation cover the most frequently encountered export requirements including the Continental European Schuko, Australian, French/Belgian, Swiss, and United Kingdom styles.

Power Distribution

International socket strips can also be used in power distribution devices in large electronic systems. Computer, communications, and military electronic systems that occupy one or more complete racks will normally incorporate some type of power distribution or control function. In these applications, individual pieces of equipment can be plugged in to an appropriate international socket strip mounted in the back of the rack. This makes it possible to use power cords or cordsets with plugs that are appropriate for the country in which the equipment will be used.

For a truly international power distribution, see the Accessory Power Strip on page 238 which is based on IEC 60320† outline.

"Universal" Power Strip and Jumper Cords

The Interpower™ Accessory Power Strip shown on page 238 is a power distribution strip based on the IEC 60320† pattern instead of a country-specific plug and socket pattern. It can be used as a power distribution device anywhere in the world in applications rated up to 10A/250VAC. Circuit protection at 10A is provided by a circuit breaker. This socket strip is approved by VDE, certified by CSA, and recognized by UL. It is connected to the power mains directly via any of the 10A cordsets described in this catalog. Peripherals and accessories are connected via cordset models.

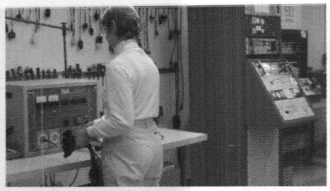
* Note: If you do not have a source of 50Hz power, see the International Power Source on pages 239-240 which converts standard 120V/60Hz North American voltage and frequency to power that is adjustable to the common voltages and frequencies used around the world.

† As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

85010120

230 and 240VAC/50Hz power source. Another option is to configure the International Socket Strip as an interface between your product and test equipment; for instance, hipot of up to 2500VAC, and 25A ground testers.

The International Socket Strip is



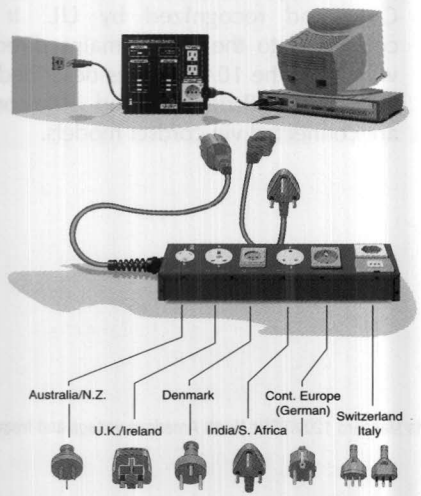
Incorporate the International Socket Strip into a rack to test products which are configured with international cords

International test sockets:
The International Socket Strip includes the sockets listed below on two separate circuits. Each circuit is rated at 16A maximum for all circuits combined.

Materials:
Metal case
PVC cordage—3 x 1.5mm²
Sockets are thermoplastic
Strain reliefs—polyamide nylon & Neoprene

International Socket Strips are tested:
In addition to visual inspection at all manufacturing stages, each socket of both circuits is checked for correct polarity and continuity. The entire socket strip is then hipot tested at 2500 VAC; this test is done on each circuit between line and neutral shorted together and ground.

Circuit/Sockets	Current Rating
230VAC/50Hz circuit:	
Continental Europe (CEE 7) (used in Germany, Austria, Finland, Netherlands, Norway, Sweden; variation with male grounding pin in socket is used in France and Belgium)	16A
Denmark (Afsnit 107-2-D1)	10A
Italy (CEI 23-16/VII)	10A
India/South Africa	15A
Switzerland (SEV 1011)	10A
240VAC/50Hz circuit:	
Australia/New Zealand (AS 3112)	10A
United Kingdom/Ireland (BS 1363)	13A



International Power Source—see pages 239-240

Convert North American 120V/60Hz to International 230-240/50Hz with the International Power Source

The Interpower™ International Power Source (IPS) provides a low-cost, convenient source of power at the various operating voltages and frequencies found around the world (typically 220-250VAC/50-60Hz), which is important for testing products to be exported. Output power is delivered through two North American sockets and one Continental European socket (international sockets avaliable when using the IPS with the international socket strip); products can be conveniently powered during development or just prior to shipment.

Rental units are available. See page 240 for more information.

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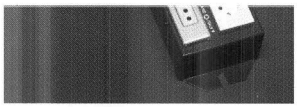
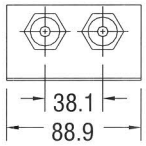
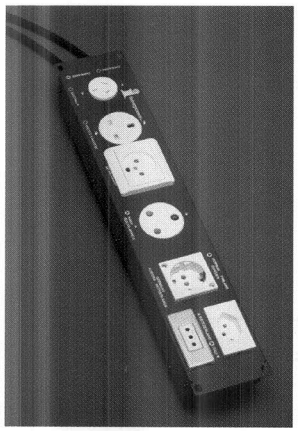


85010102: Interpower™ International Socket Strip—table mounting model. Seven international sockets on two separate circuits ready for connection to 230 and 240V/50Hz power source. Maximum 16A load for both circuits combined.
Delivery: Usually available from stock
PVC Cordage: 3x1.5mm²

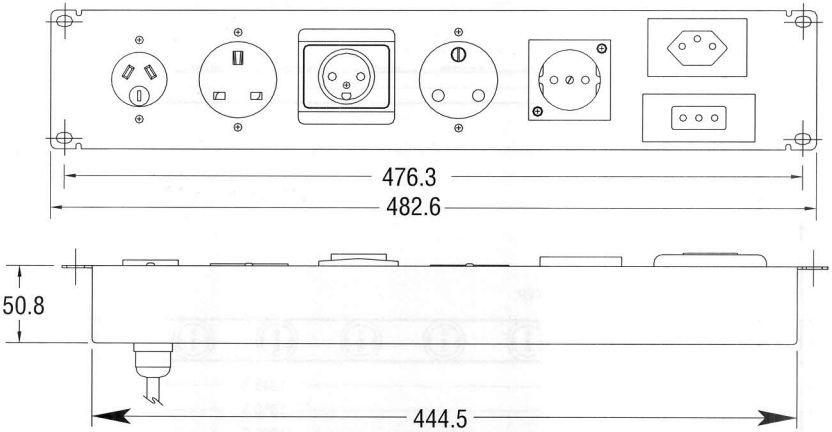
Circuit/Sockets	Current Rating
230VAC/50Hz circuit:	
Continental Europe (CEE 7)	16A
Denmark (Afsnit 107-2-D1)	10A
Italy (CEI 23-16/VII)	10A
India/South Africa	15A
Switzerland (SEV 1011)	10A
240VAC/50Hz circuit:	
Australia/New Zealand (AS 3112)	10A
United Kingdom/Ireland (BS 1363)	13A



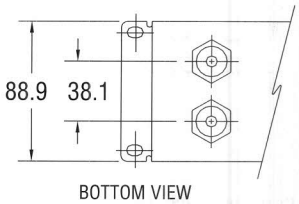
RACK MOUNT MODEL



85010112: Interpower™ International Socket Strip—rack mounting model. Seven international sockets on two separate circuits ready for connection to 230 and 240V/50Hz power source. Maximum 16A load for both circuits combined.
Delivery: Usually available from stock
PVC Cordage: 3x1.5mm²



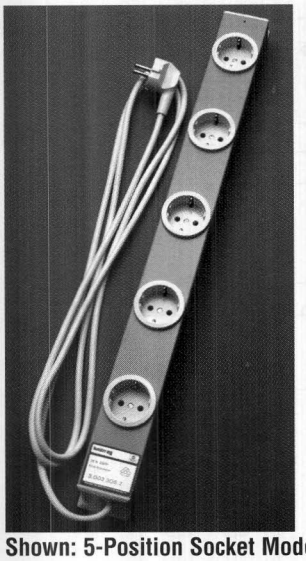
Circuit/Sockets	Current Rating
230VAC/50Hz circuit:	
Continental Europe (CEE 7)	16A
Denmark (Afsnit 107-2-D1)	10A
Italy (CEI 23-16/VII)	10A
India/South Africa	15A
Switzerland (SEV 1011)	10A
240VAC/50Hz circuit:	
Australia/New Zealand (AS 3112)	10A
United Kingdom/Ireland (BS 1363)	13A



Dimensions in mm

Continental European Socket Strips

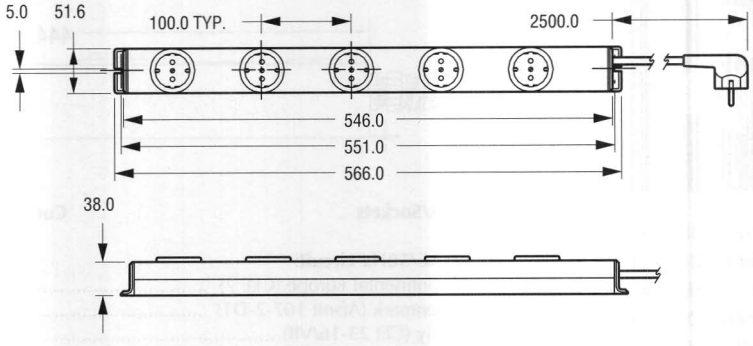
With 5, 9, or 13 Sockets



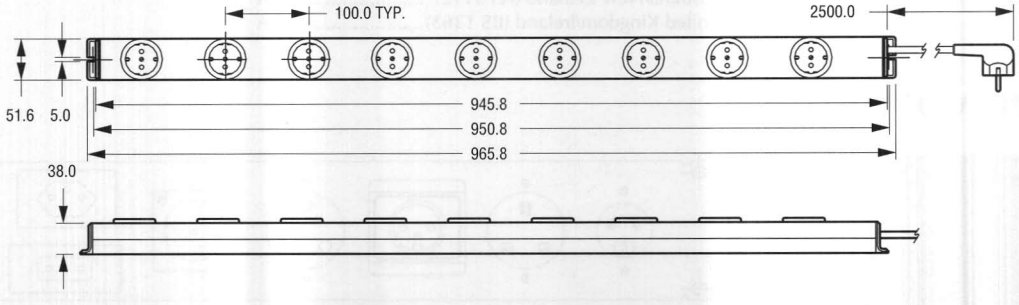
Shown: 5-Position Socket Model
PVC Cordage: 3x1.5mm²

Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Color	Rating 250(VAC)	Approval
85023050	CEE 7	5	566.0				2.5m	CEE 7/7	Metal	Orange	16A	
85023090	CEE 7	9	965.8				2.5m	CEE 7/7	Metal	Orange	16A	
85023130	CEE 7	13	1365.3				2.5m	CEE 7/7	Metal	Orange	16A	

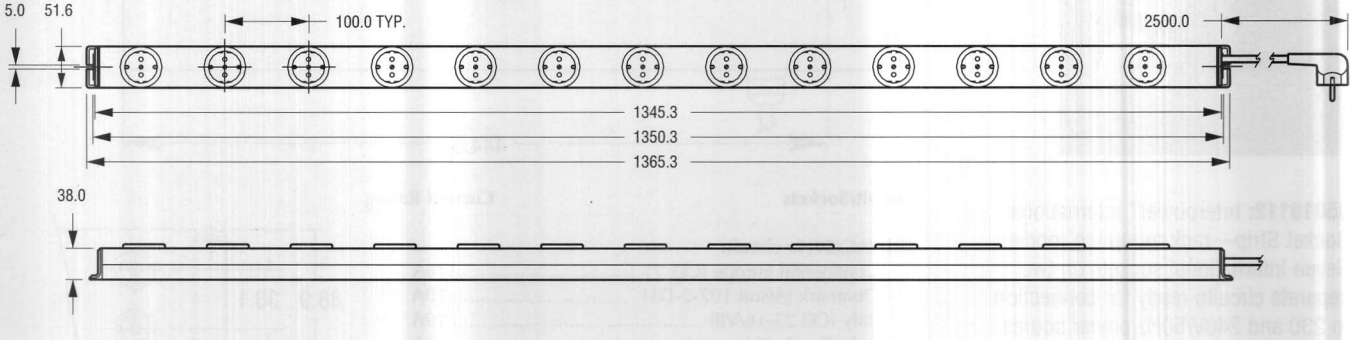
85023050 Drawings:



85023090 Drawings:



85023130 Drawings:



Note: Continental European CEE 7 sockets are used in Germany, Austria, Finland, the Netherlands, Norway, and Sweden. French and Belgium socket strip (with male grounding pin in socket) also available.

Dimensions in mm

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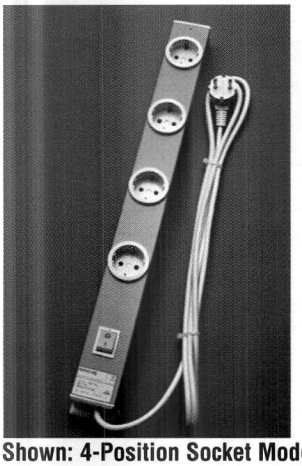
With Lighted Rocker Switch and 4, 8, or 12 Sockets

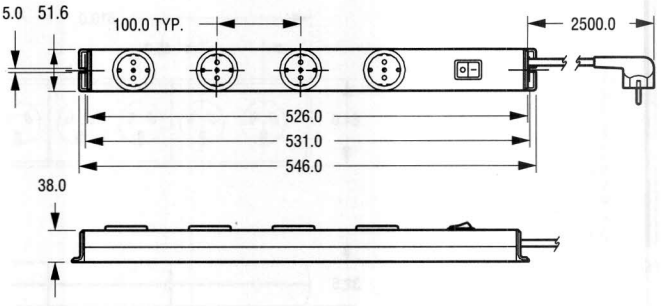


Shown: 4-Position Socket Model
PVC Cordage: 3x1.5mm²

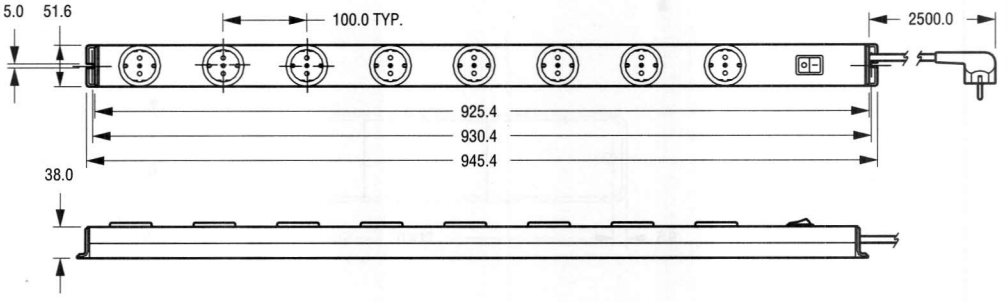
Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Rating Color	250(VAC)	Approval
85003040	CEE 7	4	546.0	■*			2.5M	CEE 7/7	Metal	Orange	16A	
85003080	CEE 7	8	945.4	■*			2.5M	CEE 7/7	Metal	Orange	16A	
85003120	CEE 7	12	1344.6	■*			2.5M	CEE 7/7	Metal	Orange	16A	

* lighted

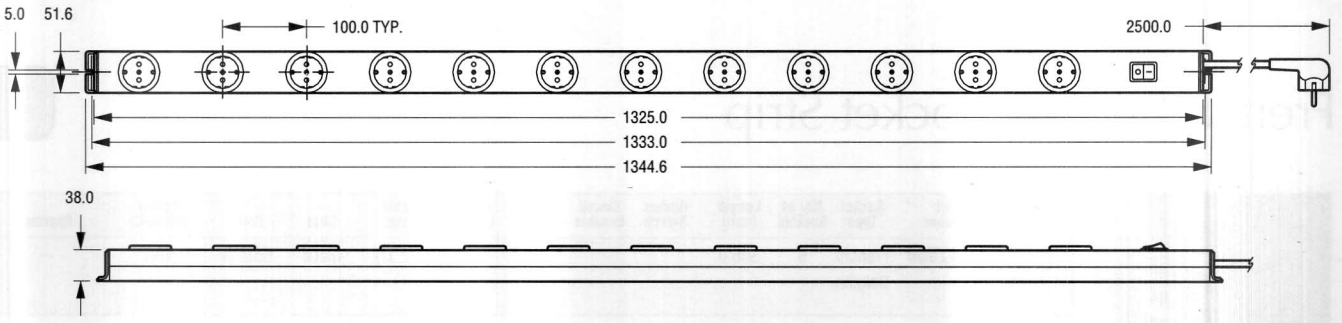
85003040 Drawings:



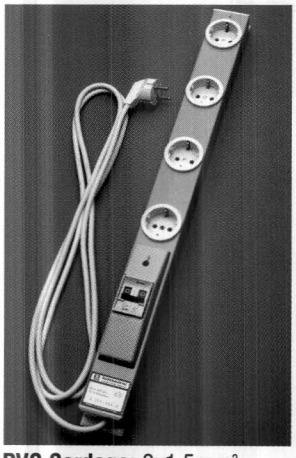
85003080 Drawings:



85003120 Drawings:

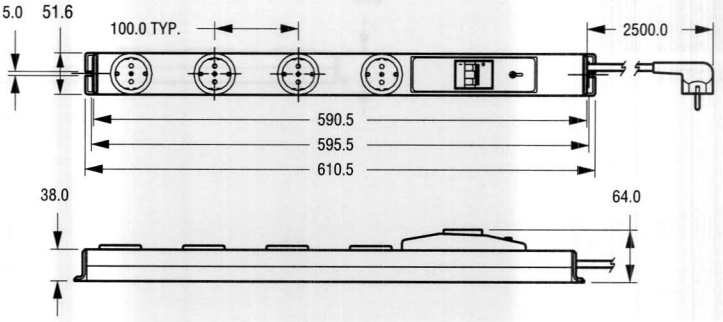


With Circuit Breaker and 4 Sockets



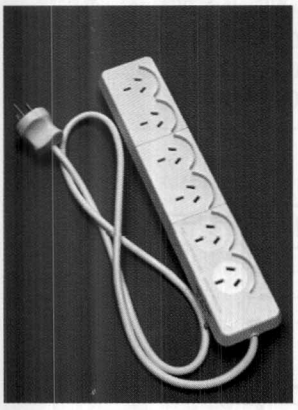
PVC Cordage: 3x1.5mm²

Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Color	Rating 250(VAC)	Approval
85013040	CEE 7	4	610.5		■		2.5m	CEE 7/7	Metal	Orange	16A	



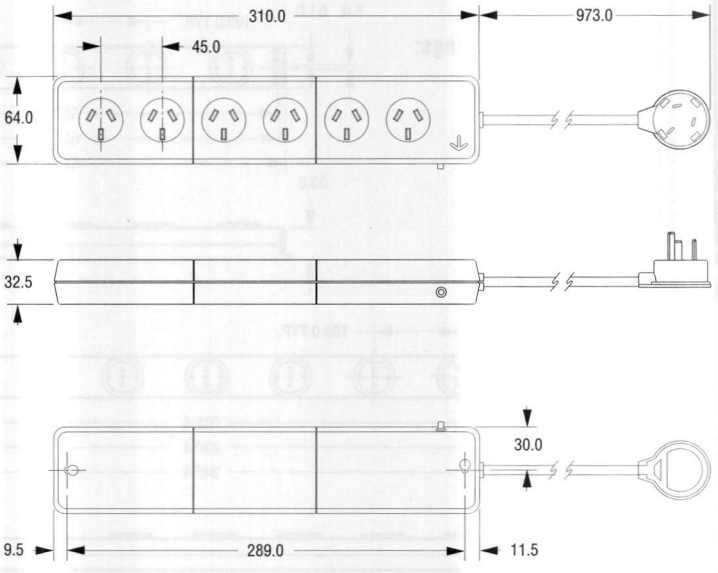
Dimensions in mm

Australian Socket Strip



PVC Cordage: 3x1.5mm²

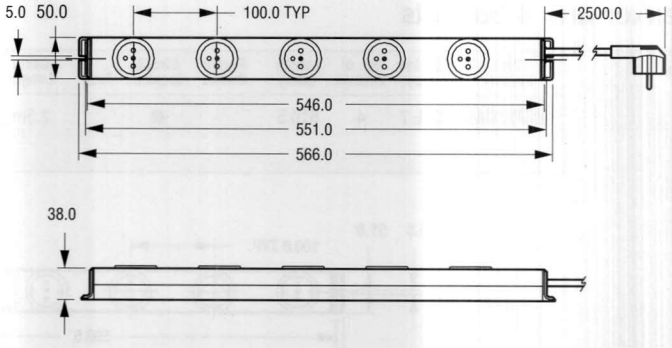
Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Color	Rating 250(VAC)	Approval
85010050	AS 3112	6	310.0		■		1.0m	AS 3112	Plastic	White	10A	Department of Fair Trading



French/Belgian Socket Strip

PVC Cordage: 3x1.5mm²

Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Color	Rating 250(VAC)	Approval
85032050	French/ Belgian	5	566.0				2.5m	CEE 7/7	Metal	Orange	16A	–



Dimensions in mm

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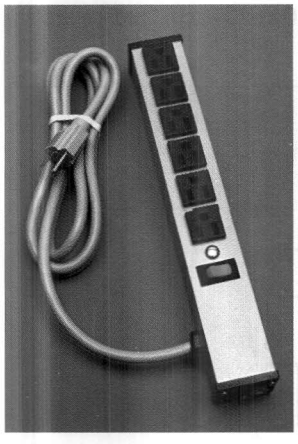
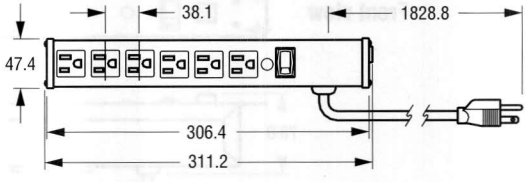
With Circuit Breaker, Rocker Switch, and 6 Sockets

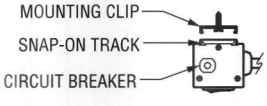


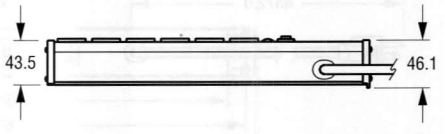
Standard North American socket strip rated 15A/125VAC max. Meets UL 1363. Cordage is gray 3x14 SJT. Includes clips for mounting on panel or wall.

Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Color	Rating 125(VAC)	Approvals
85010200	NEMA 5-15R	6	311.2	■*	■		1.8m	NEMA 5-15P	Aluminum/ plastic	Gray	15A	UL CSA

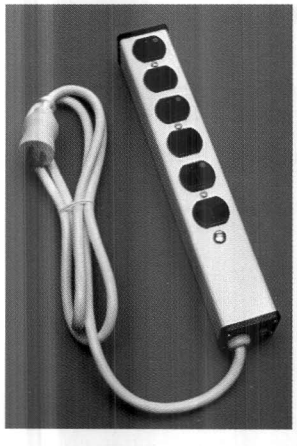
***lighted**





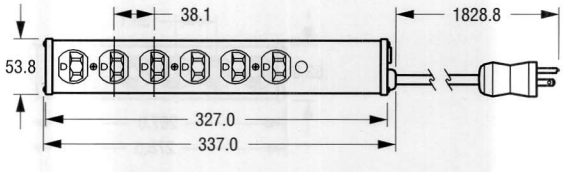


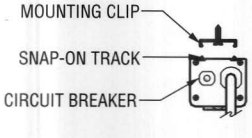
Hospital Grade—with Circuit Breaker & 6 Sockets

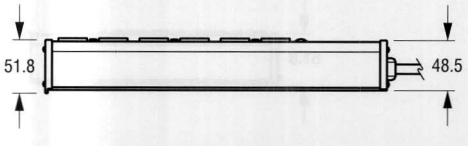


For medical applications. Meets UL 1363 and 544. Note: Strip must be plugged into a Hospital Grade receptacle to ensure grounding. 3x14 SJT cordage with hospital grade plug. Includes clips for mounting on panel or wall.

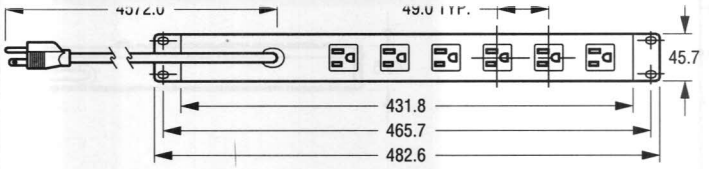
Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Color	Rating 125(VAC)	Approvals
85010210	NEMA 5-15R	6	337.0		■		1.8m	NEMA 5-15P	Aluminum/ plastic	White	15A	UL CSA



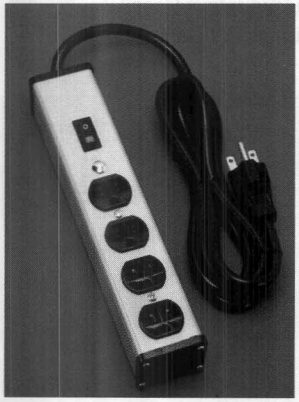




Dimensions in mm

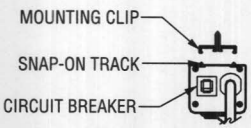


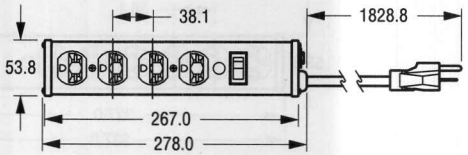
For 230V Circuits— with Rocker Switch, Circuit Breaker & 4 Sockets

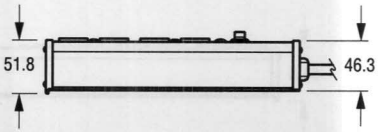


Intended for use in 230V circuits, this socket strip is rated 15A/250VAC with NEMA 6-15 sockets. Cordage is gray 3x14 SJT. Includes clips for mounting on panel or wall.

Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Color	Rating 250(VAC)	Approval
85010231	NEMA 6-15R	4	278.0	■			1.8m	NEMA 6-15P	Aluminum/ plastic	Silver	15A	







Dimensions in mm

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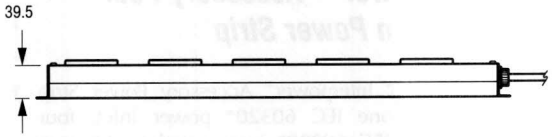
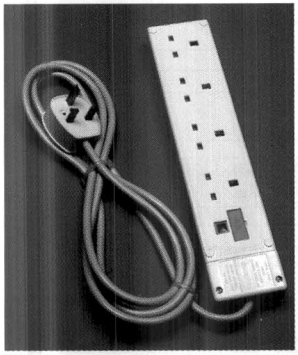
Fax toll-free: (800) 645-5360

PVC Cordage: 3x1.0mm²

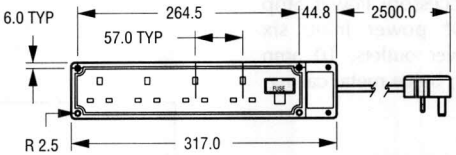


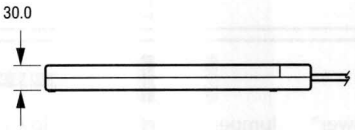
United Kingdom Socket Strips

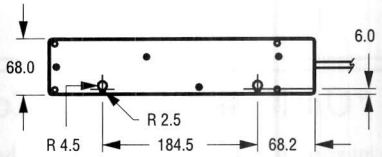


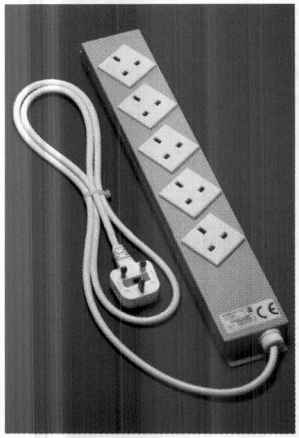
PVC Cordage: 3x1.5mm²

Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Color	Rating 250(VAC)	Approval
85010322	BS 1363	4	317.0		■		2.5m	BS 1363	Plastic	White	13A	—



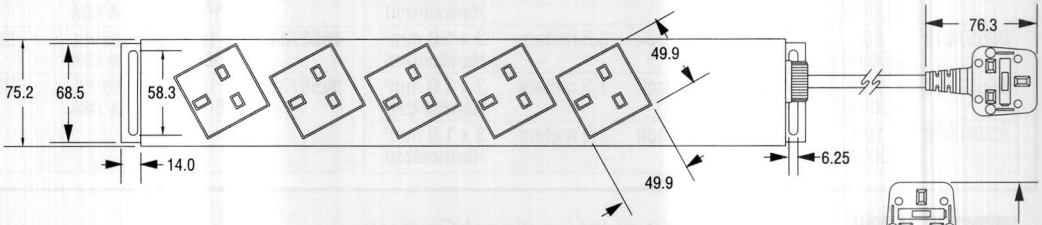


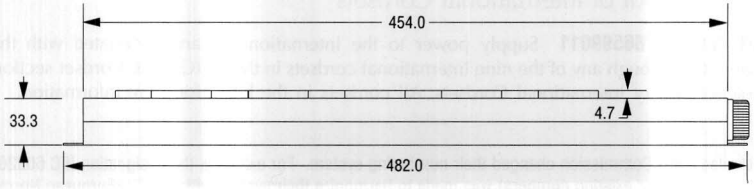


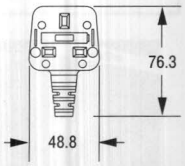


PVC Cordage: 3x1.5mm²

Part Number	Socket Type	No. of Sockets	Length (mm)	Rocker Switch	Circuit Breaker	Fuse	Cable Length	Cable Plug	Case	Color	Rating 250(VAC)	Approval
85031053	BS 1363	5	482.0		■		2.4m	BS 1363	Metal	Gray	13A	—







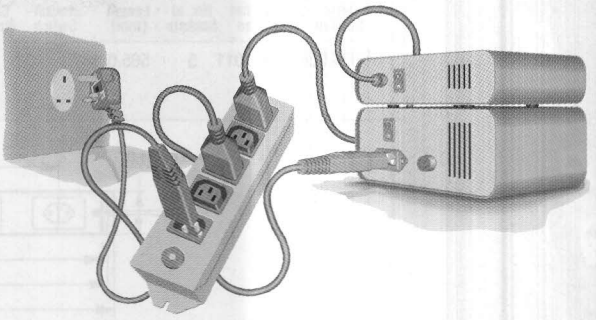
Dimensions in mm

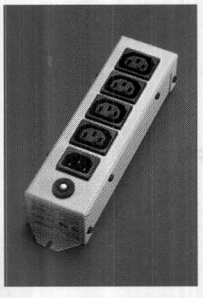
Interpower™ Accessory Power Strip

A "Universal" Power Distribution System based on IEC 60320*

This power distribution system is based on the IEC 60320* standard and can be used in both North American and international markets.

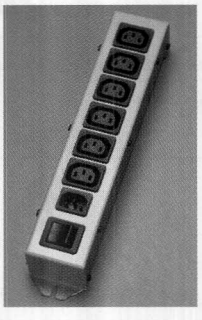
Power can be supplied to the Accessory Power Strip with any cordset terminated with an IEC 60320* connector. The Accessory Power Strip supplies power to four devices from the "reverse" (IEC 60320*-2-2 sheet F) outlets by the use of the universal jumper cordsets listed below.





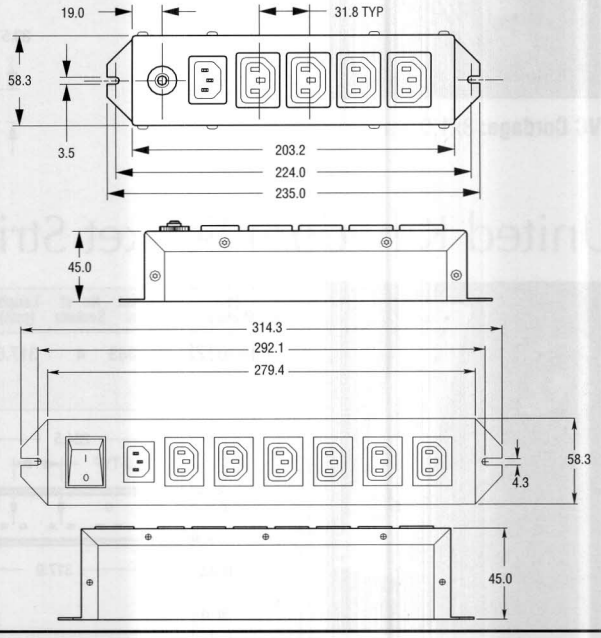
Interpower™ Accessory Four Position Power Strip

#85010070: Interpower™ Accessory Power Strip contains one IEC 60320* power inlet; four "reverse" IEC 60320* power outlets. 10 amp single pole circuit breaker; beige metal casing.
Approvals: UL recognized, CSA certified, VDE Gutachten
Rating: (10A/250VAC)

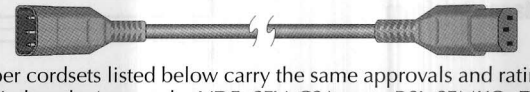


Interpower™ Accessory Six Position Power Strip

#85010080: Interpower™ Accessory Power Strip contains one IEC 60320* power inlet; six "reverse" IEC 60320* power outlets. 10 amp double pole circuit breaker; beige metal casing.
Approvals: UL, CSA
Rating: (10A/250VAC)



"Universal" Jumper Cordsets



Interpower's "Universal" Jumper cordset for use with Interpower™ Accessory Power Strip (shown above); meets requirements of international safety agencies.

Jumper cordsets listed below carry the same approvals and ratings, but vary in length. Approvals: VDE, SEV, CSA cert., BSI, SEMKO, DEMKO, FIMKO, IMQ, KEMA, OVE, NEMKO, LCIE, CEBEC(10A/250VAC)

Part No.	Current Rating	Maximum Temp. (°C)	Color	Length (± 0.1m)	Cable
86557000	10A 250VAC	60°/CSA 65°/VDE	Black	1.0 meter	3 x 1.0 mm² Harmonized
86557010	10A 250VAC	60°/CSA 65°/VDE	Black	2.5 meters	3 x 1.0 mm² Harmonized
86557030	10A 250VAC	60°/CSA 65°/VDE	Black	0.5 meters	3 x 1.0 mm² Harmonized
86557040	10A 250VAC	60°/CSA 65°/VDE	Black	1.5 meters	3 x 1.0 mm² Harmonized
86557050	10A 250VAC	60°/CSA 65°/VDE	Black	2.0 meters	3 x 1.0 mm² Harmonized

Part No.	Current Rating	Maximum Temp. (°C)	Color	Length (± 0.1m)	Cable
86557060	10A 250VAC	60°/CSA 65°/VDE	Black	3.0 meters	3 x 1.0 mm² Harmonized
86557300	10A 250VAC	60°/UL & CSA	Black	1.0 meters	3 x 18 AWG
86557310	10A 250VAC	60°/UL & CSA	Black	2.5 meters	3 x 18 AWG
86557320	10A 250VAC	60°/UL & CSA	Black	3.0 meters	3 x 18 AWG

Dimensions in mm

Designer's Kit of International Cordsets

Part Number: 86599011 Supply power to the International Power Strip through any of the nine International cordsets in the Designer's Kit of International Cordsets. All cordsets in the kit are terminated with the IEC 60320* connector. See page 74 (Cord & Cordset section) or page 242 (Kits and Panels section) for more information.

* As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

† These parts carry UL Recognition and CSA Certification only.

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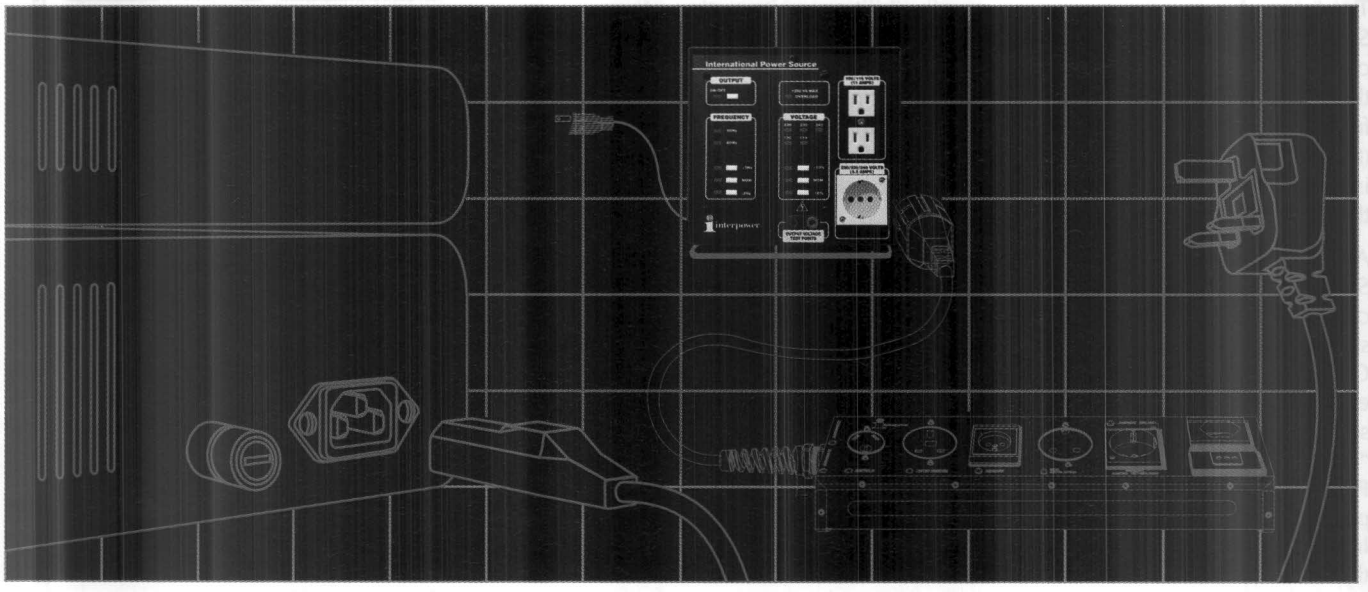
International Power Source



Make sure your product will work overseas...

Your overseas customer expects your product to work when it is unpacked from the box. Designing a product with your international customer in mind is good for customer relations and gives you a competitive advantage. When customers are satisfied with your product, they are more likely to buy your products again and recommend them to others.

The following considerations should be addressed for the convenience of your international customers:

Use the correct plug/socket standard: There are currently twelve common (3-wire) plug and socket standards used internationally. Equip your product with the correct plug for the country to which your product will be exported. (See the fold-out poster in the Designer's Reference Section for guide to international plugs and sockets.) Be sure to equip your product with the necessary cables and connectors so your customer won't have to find adapters or otherwise modify your product before use. Harmonized cordage is required on products being exported to Europe.

Set your product at the correct voltage and frequency: European voltages are typically 230VAC/50Hz for Europe and 240VAC/50Hz in Australia.

Select the correct fuse type: International and North American fuse specifications and sizes differ. Use an IEC 60127* (5 x 20mm) fuse so that your international customer will be able to purchase replacement fuses.

Design your product to meet the correct international safety standards: For example, according to EMC Directive 89/336/EEC, equipment sold in Europe after January 1, 1997 must carry the CE Mark.

Test your product at international voltages and frequencies: Testing at your customer's voltage and frequency prior to shipment assures that your equipment will work when it finally reaches your overseas customer.

The International Power Source allows you to simulate field conditions (high-line and low-line voltages) on prototypes. Fluctuations in frequency can also be simulated. By testing during the design process, the manufacturer can save costly modifications after the product is in production, and avoid costly failures, field repairs, and/or returns.

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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stations or lab positions as needed. Output power is delivered through either a standard U.S. 15A/125VAC socket or the Continental European "Schuko" CEE 7 socket. (Note: Products with other international plugs can be tested by using the International Socket Strip. Shown on the facing page.)

All parameters are easily accessible to speed testing. Output voltages are selected at 100V, 115V, 220V, 230V, or 240V, ±10%. Frequencies can be selected at 50 or 60Hz, ±3Hz. This through a cordset rated at 20A that consists of a **NEMA 5-20** plug and an IEC 60320* sheet C19 connector. It can also be configured for 230 or 240 VAC input power by equipping it with an international cordset for overseas applications.

Dimensions: 222mm wide x 216mm tall x 457mm deep.

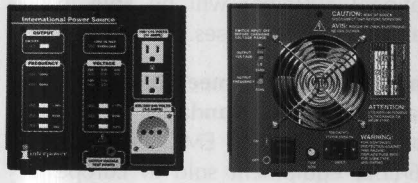
Delivery: Usually available in stock. Call the Panel Components Corporation's Customer Service Department at (800) 662-2290 for stock level.

Rental units are available:

Call for current rental price (usually 10% of purchase price). Minimum rental is one month; up to three month's rental fees will be applied to purchase price. Contact our Customer Service Department for more information.

Interpower™ International Power Source

Models are light weight and easily portable.



INTERPOWER™ INTERNATIONAL POWER SOURCE

INPUT POWER RANGE:
100-240VAC or 85-265VAC/45-63Hz
supplied through: **NEMA 5-20** Plug
(unless specified otherwise)
DELIVERS VOLTAGES:
100-240VAC at either 50 or 60Hz

This model is available to meet your input and output power requirements.

CE

Harmonic Distortion:	Less than 2.0%
Output Noise:	
Low Range:	425mV (115V)
High Range:	850mV (230V)
Power Factor:	0 to Unity, lagging or leading
Input:	
Voltage:	100-240VAC or 85-265VAC
Current:	20A RMS Max. at 85V
Frequency:	45-63Hz
Holdup Time:	20mS
Isolation Voltage:	
Input/Output:	2200V RMS
Input/Chassis:	1350V RMS
Protection:	Output overcurrent (short circuit/over voltage); over temperature
Dimensions:	216mm H x 222mm W x 457mm D
Weight:	13.6kg
Air Intake/Exhaust:	Rear/Sides
Operating Temp.:	0°C to 40°C
Approvals:	UL, CUL

LOW SINE WAVE DISTORTION: These models have low distortion of the sine wave when connected to heavy non-linear loads (which includes most electronic equipment). They also have lower distortion without loads or with linear loads (motors, resistors, etc.) A feedback circuit responds quickly to the load to correct and maintain a symmetrical sine wave.

NOISE REDUCTION: Superior power transformer construction reduces acoustic noise. Heat sinks are internal; cooling vents through rear air ports with no annoying side air flow.

RFI NOISE REDUCTION: Internal construction is modular; power amplifier is a single shielded, plug-in assembly.

LOW-LINE TOLERANCE: New models are very tolerant of low-input line voltage.

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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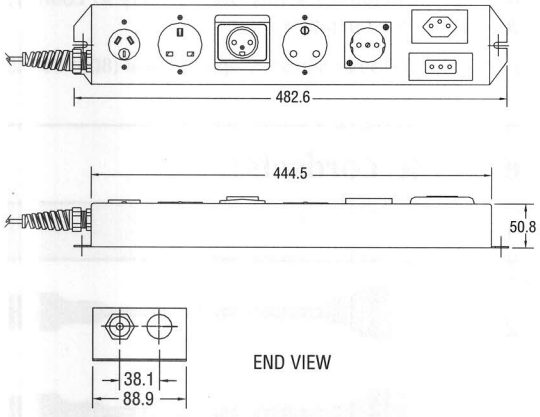
Interpower™ International Socket Strip

The Interpower™ International Socket Strip incorporates seven (Continental Europe, Denmark, Italy, India/South Africa, Switzerland, United Kingdom/Ireland, and Australia/New Zealand) of the main overseas standards in one device. Connect it to your own power source in burn-in racks or test labs where products with international cords or cordsets are being prepared for export; or, use it for receiving inspection on international cords and cordsets.

Installation to Your Power Source: The International Socket Strip is equipped with one power cord terminated with a Continental European plug for connection to the Continental European socket on the front of the IPS. The conductor size is 1.5mm² (slightly larger than 16AWG which is approximately 1.23mm²). The cord is 2.5 meters long and voltage is clearly marked. The primary insulation is color coded in accordance with international standards: brown=line, blue=neutral, green-yellow=ground.

85010120: Model for International Power Source



Dimensions in mm

85010120:
Interpower™ International Socket Strip

Size:
482.6mm
x 88.9mm
x 50.8mm

Weight:
2625g

Delivery:
from stock

SOCKETS INCLUDED:

230VAC/50Hz circuit:
- Continental Europe (CEE 7)* 16A
- Denmark (Afsnit 107-2-D1) 10A
- Italy (CEI 23-16/VII) 10A
- India/South Africa 15A
- Switzerland (SEV 1011) 10A
- United Kingdom/Ireland (BS 1363) 13A

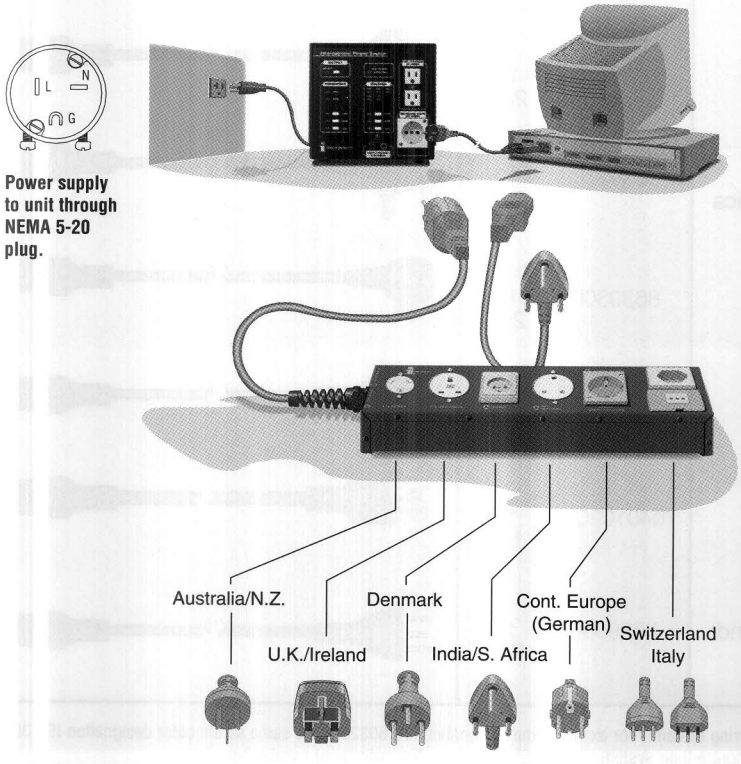
240VAC/50Hz circuit:
- Australia/New Zealand (AS 3112) 10A

SPECIFICATIONS:

Materials: Case — metal; cordage — PVC

*CEE 7 is used in Austria, Finland, the Netherlands, Norway, Sweden, and Germany. Variation of socket with male grounding pin is used in France and Belgium.

Testing: In addition to visual inspection at all manufacturing stages, each socket of both circuits is checked for correct polarity and continuity. The entire socket strip is then hipot tested at 2500VAC; this test is done on each circuit between line and neutral (which have been shorted together) and ground.



◀ OPERATING THE INTERNATIONAL POWER SOURCE

The Interpower™ International Power Source comes equipped with two NEMA 5-15 Receptacles and a Continental European receptacle. The **Interpower™ International Socket Strip** (shown at left, also available from Panel Components Corporation) is terminated with a Continental European plug, allowing for quick connection to the International Power Source. The International Socket Strip incorporates seven of the main international socket standards in one device. It may be used to test products configured with international cords and cordsets, or for inspection on products which are received with international power cords.

Designer's Kit of International Cordsets

Simplify your power systems design with sample kits from Panel Components Corporation.

86599011:
Interpower™ Designer's Kit of International Cordsets
Size: 483mm x 394mm x 102mm
Weight: approx. 4kg
Delivery: from stock

Features:

- **Nine cordsets with the most common international plugs; each cordset is terminated with the IEC 60320* appliance connector, a common standard in the industrialized world.**
- **Complete specs on each cordset for use in developing your purchasing specifications. Each spec includes:**
  1) a general description of the cordset;
  2) applicable international standards;
  3) required safety agency approvals;
  4) mechanical specifications on cordage, plugs, and IEC 60320* connectors;
  5) electrical rating;
  6) outline and dimensioned drawings of each cordset.
- **Information on world plug and socket standards, world electrical voltages and frequencies, and design information as detailed in Panel Components Corporation's publications.**

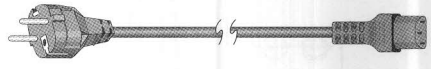
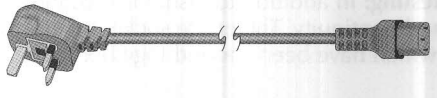
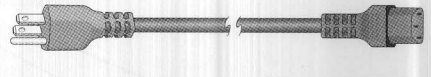
† We reserve the right to substitute part numbers to reflect product changes; substitution is sometimes necessary to update product approvals or to change manufacturers to improve delivery times.

Nine international cordsets are packaged in a convenient, portable box for use by:

- ***Design engineers who configure products for export...*** use these cordsets and the design information included in the kit to configure the electrical system of your product. Complete specifications on each cordset simplify the development of your purchasing specifications.
- ***Engineers who test products prior to shipment overseas...*** the kit conveniently organizes international cordsets for use in your test and burn-in lab.
- ***International travelers who carry and use equipment which must be properly plugged in and grounded...*** the nine cordsets in this kit represent the major plug standards used in the world today. You can plug in and use your computer (or other electrical equipment) almost anywhere where there is a grounded electrical system. (**Note:** World voltages and frequencies vary from country to country; set your equipment at the proper voltage and frequency before operation!)

(Cords and cordsets are also sold individually. Call our Customer Service Department at (800) 662-2290 for further information.)

The Designer's Kit includes these cordsets:

	Country	Part No.†	Rating	
A	Continental Europe	86230030	10A 250V	
B	Australia, New Zealand	86210030	10A 250V	
C	U.K. Ireland	86397010	10A 250V	
D	Denmark	86391000	10A 250V	
E	India, South Africa	86392000	10A 250V	
F	Israel	86393000	10A 250V	
G	Italy	86394000	10A 250V	
H	N.A.	70401020244	10A 125V	
J	Switzerland	86396000	10A 250V	

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example, the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was to harmonize their system with the EN (European Normalisation) numbering system.

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Export Designer's Reference Section

World Plug Patterns: The Designer's Reference section contains a detailed list of single-phase power mains voltages and frequencies organized by country. Although this list contains the details, designers can use the following as a rule of thumb:

100-120V/60Hz countries: North America, Venezuela, Colombia, Ecuador, Northern Caribbean Islands (Cuba, Haiti, Dominican Republic, Puerto Rico, Virgin Islands, Bahamas), Taiwan and South Korea.

100V/50 *and* 60 Hz: Japan.

220-240V/50Hz: Most of the rest of the world.

The information contained in this list is, to the best of our knowledge, factual. Furthermore, wherever possible, we have continually verified our data base by comparing it to new information which we have gathered from a variety of sources. Nonetheless, while information on the electrical systems of the world's industrialized nations is reliable and readily available, information from the developing world is sparse, frequently unreliable, and difficult to verify. Furthermore, it may be entirely irrelevant if a specific medical or computer complex, for example, has its own dedicated power generating plant. Finally, voltage tolerances of ±10% and frequency tolerances of ±3 Hz that apply in many industrialized countries are a far-off dream in places where the power may be on for only 4-5 hours per day. Therefore, the information contained in this section must be used with due regard for its limitations, particularly in the case of the world's developing nations.

Standards Agencies: This comprehensive list of the world's testing and standards agencies is also continually updated with information from many sources. If you encounter a testing or standards agency that is not listed here, or have a correction to telephone and Fax numbers, we would appreciate hearing about it.

The national agencies that are likely to impact designers of electrical products are at present UL and CSA in North America and VDE, SEMKO, SEV and BSI in Europe. Although most agencies, including those listed above, now write national standards based on IEC publications, these agencies frequently publish standards which incorporate requirements unique to their countries. Furthermore, the national markets involved are among the biggest in the world and, therefore, the requirements of the respective agencies warrant close attention.

Standards Publications: This list contains North American and international standards and related publications that are relevant for specifiers of primary power components.

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		P. O. Box 1055 Strathfield, NSW 2135, AUSTRALIA Telephone: (61) 2 746 4900 FAX: (61) 2 746 8460 www.standards.com.au		Subsidiary of Standards Australia P. O. Box 115 Strathfield, NSW 2135, AUSTRALIA Telephone: (61) 2 9746 4900 FAX: (61) 2 9746 8460 www.qas.com.au Testing and Certification Services of Australia 14 Nelson Street Chatswood, NSW 2067, AUSTRALIA Telephone: (61) 2 9410 5134 FAX: (61) 2 9415 1567 Department of Fair Trading New South Wales 1 Fitzwilliam Street Parramatta, NSW 2124, AUSTRALIA Telephone: (61) 2 9895 0709 FAX: (61) 2 9689 2751 Victoria Office of the Chief Electrical Inspector South Bank, Victoria 3205, AUSTRALIA Telephone: (61) 3 9203 9775 FAX: (61) 3 9686 2197 Queensland The Department of Mines and Energy 55 Little Edward Street Springhill 4000, Queensland, AUSTRALIA Telephone: (61) 7 3237 0278 FAX: (61) 7 3237 0229 www.dme.qld.gov.au Western Australia Office of Energy 20 Southport Leederville, Western Australia, AUSTRALIA Telephone: (61) 8 9422 5282 FAX: (61) 8 9422 5222 South Australia Office of Energy Policy Level 19 30 Wakefield Street Adelaide 5000, South Australia, AUSTRALIA Telephone: (61) 8 8226 5530 FAX: (61) 8 8226 5531 www.energy.sa.gov.au
AUSTRIA 		(Ön) - Österreichisches Normungsinstitut Postfach 130, Heinestrasse 38 A-1021 Wein 2, AUSTRIA Telephone: (43) 1 213 008 05 FAX: (43) 1 213 008 18	ÖVE	ÖVE — Österreichischer Verband Für Elektrotechnik ***(NCB)*** Eschenbachgasse 9 A-1010 Wien, AUSTRIA Telephone: (43) 1 587 63 73 FAX: (43) 1 586 7408 ove.e2i.at

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COUNTRY	STANDARD AGENCY SYMBOL	STANDARDS AGENCY	TEST AGENCY SYMBOL	TESTING AND/OR CERTIFICATION AGENCY
BELARUS		Belarus National Committee of the IEC Belstandart Starovilensky Trakt, 93 BY - 220553 Minsk, BELARUS Telephone: (37) 5 172 37 52 13 FAX: (37) 5 172 37 25 88		
BELGIUM		IBN/BIN - Institut Belge de Normalisation/Belgisch Instituut voor Normalisatie Avenue de la Brabanconne 29 Brabanconnelaan 29 B-1000 Bruxelles, Brussells, BELGIUM Telephone: (32) 2 738 01 11 FAX: (32) 2 733 4264	CEBEC	CEBEC — CEBEC Registered Quality ***(NCB)*** Avenue F. Van Kalken 9A/1 Brussel, B-1070 BELGIUM Telephone: (32) 2 556 0020 FAX: (32) 2 556 0036 www.ceb.arc.be
BOSNIA & HERZEGOVINA		IEC National Committee of Bosnia & Herzegovnia (BAKE) BASMP Dubrovacka 6 BA - 71000, SARAJEVO Telephone: (387) 71 20 70 15 FAX: (387) 71 20 70 16		
BRAZIL		Brazilian National Committee of the IEC COBEI - ABNT/CB-03 Rua Libero Badaro, 496-10º andar BR-01008-000, SAO PAULO Telephone: (55) 11 239 1155 FAX: (55) 11 3104 0192 www.abnt.org.br	**ABNT**	ABNT — Associação Brasileira de Normas Tecnicas Av 13 de Maio, 13-27° andar Rio de Janeiro-RJ, 20003-900 BRAZIL Telephone: (55) 21 210 3122 FAX: (55) 21 532 2143 www.abnt.org.br
BULGARIA		Bulgarian National Committee of the IEC Committee for Standardization and Metrology 21, 6th September St. Sofia 1000, BULGARIA Telephone: (359) 2 875 950 FAX: (359) 2 801 402		BDS — National System of Metrology Standardization and I 21, 6th September St. Sofia 1000, BULGARIA Telephone: (359) 2 875 950 FAX: (358) 2 801 402
CANADA	CSA®	CSA — Canadian Standards Association ***(NCB)*** 178 Rexdale Blvd. Etobicoke (Toronto), Ontario M9W 1R3, CANADA Telephone: (416) 747-4000 FAX: (416) 747-4149 www.csa.ca Standards Council of Canada International Standardization Division 45 O'Conner Street, Suite 1200 Ottawa, Ontario K1P 6N7, CANADA Telephone: (613) 238-3222 FAX: (613) 995-4564 www.scc.ca	CSA®	Other CSA offices: 865 Ellingham Street, Pointe-Claire (Montréal) PQ H9R 5E8 Telephone: (514) 694-8110 FAX: (514) 694-5001 13799 Commerce Parkway, Richmond (Vancouver) BC, V6V 2N9 Telephone: (604) 273-4581 FAX: (604) 244-6600 1707 94th Street, Edmonton, AB T6N 1E6 Telephone: (403) 450-2111 FAX: (403) 435-0998
COLUMBIA		Instituto Colombiano Normas Ténicas 4 Certification (ICON TEC) Carrera 37 N° 52-95 Santafe De Bogota, D.C., COLUMBIA Telephone: (57) 1 315 03 77 FAX: (57) 1 222 1435		
CROATIA		State Office for Standardization and Metrology Ulica Grada Vukovara 78 HR-1000 Zagreb, CROATIA Telephone: (385) 1 613 34 44 FAX: (385) 1 53 66 88		

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CUBA, REP. OF		Cuban National Bureau of Standards Oficina Nacional De Normalizacion Calle E No. 261 entre 11 y 13 Venado, Cuidad De La Habana 10400, REPUBLIC OF CUBA Telephone: (53) 7 30 0835 FAX: (53) 7 33 8048		
CHINA, PEOPLE'S REPUBLIC OF		CSBS China State Bureau for Standardization 4 Zhichun Rd., Haidian Dist. P. O. Box 8010 Beijing, 100088 PEOPLE'S REPUBLIC OF CHINA Telephone: (86) 10 6202 2288 FAX: (86) 10 6203 3737		CCEE — China Comm. for Conformity Certification of Electrical Equipment ***(NCB)*** 2 Shoudu Tiyuguan Nanlu 100044 Beijing PEOPLE'S REPUBLIC OF CHINA Telephone: (86) 10 683 36 219 FAX: (86) 10 683 60 907
CYPRUS		Cyprus Organization for Standards & Control of Quality Ministry of Commerce, Industry & Tourism 1421 Nicosia, CYPRUS Telephone: (357) 2 30 01 92 FAX: (357) 2 37 51 20		
CZECH REPUBLIC		Czech National Committee of the IEC Czech Standards Institute Biskupsky dvur 5 110 02 Praha 1 CZECH REPUBLIC Telephone: (42) 2 21 802 100 FAX: (42) 2 21 802 311		Elektrotechnicky zkusebni ustav ***(NCB)*** Pod lisen 129 CZ 171 02 Praha 8 CZECH REPUBLIC Telephone: (42) 2 661 04 111 FAX: (42) 2 688 00 37
DENMARK		DANSK Standard Kollegievej 6 DK-2920 Charlottenlund DENMARK Telephone: (45) 39 96 6101 FAX: (45) 39 96 6102 www.ds.dk		DEMKO A/S ***(NCB)*** Lyskaer 8, Postbox 514 DK-2730 Herlev DENMARK Telephone: (45) 44 85 6565 FAX: (45) 44 85 6500 www.demko.dk
EGYPT	EOS	EOS — Egyptian Organization for Standardization & Quality Control 2 Latin America St. Garden City, Cairo, EGYPT Telephone: (20) 2 354 9720 FAX: (20) 2 355 7841		The Egyptian National Committee Ministry of Electricity and Energy Abbassia Post Office Cairo, EGYPT Telephone: (20) 2 83 06 41 FAX: (20) 2 261 65 12
ESTONIA		Estonian Electrotechnical Committee for Standardization Kopli 82 EE-0004 Tallinn, ESTONIA Telephone: (372) 6203 755 FAX: (372) 6203 751		
FINLAND		Finnish Electrotechnical Standards Association P. O. Box 134 FI - 00211 Helsinki, FINLAND Telephone: (358) 9 696 391 FAX: (358) 9 677 059 www.sesko.fi	FI	FIMKO — FIMKO LTD ***(NCB)*** P.O. Box 30 Särkiniementie SF-00211 Helsinki 21, FINLAND Telephone: (358) 9 696 361 FAX: (358) 9 692 5474 www.fimko.fi
FRANCE		UTE — Union Technique de l'Électricité 33, Avenue du Général Leclerc BP 23 FR - 92262 Fontenay aux-Roses, FRANCE Telephone: (33) 1 40 93 62 00 FAX: (33) 1 40 93 44 08 www.ute-fr.com AFNOR — Association Francaise de Nomalisation Tour Europe 92049 Paris La Defense Cedex Telephone: (33) 1 42 91 55 55 FAX: (33) 1 42 91 5656		LCIE — Laboratoire Central des ***(NCB)*** industries électriques BP 8 F - 92260 Fontenay aux-Roses, FRANCE Telephone: (33) 1 40 95 5519 FAX: (33) 1 40 95 5520 www.ccip.fr.com

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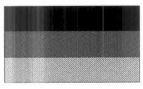
GERMANY 		DKE — Deutsche Elektrotechnische Kommission im DIN und VDE (German Electrotechnical Commission of DIN and VDE) Stresemannallee 15 DE - 60596 Frankfurt Am Main GERMANY Telephone: (49) 69 630 80 FAX: (49) 69 96 3152 18 www.vde.de DIN Deutsches Institut für Normung Burggrafenstrasse 6 D-10787 BERLIN, GERMANY Telephone: (49) 30 26 01 0 FAX: (49) 30 26 01 12 31 www.din.de **LGA** (Landesgerwerbeanstalt Bayem) Tillystrasse 2 D-90431 Nuremberg, GERMANY Telephone: (49) 911 6 55 50 FAX: (49) 911 6 55 42 35 www.lga.de		**VDE** ***(NCB)*** **VDE**-Prüf und Zertifizierungsinstitut Merianstrasse 28 D - 63069 Offenbach am Main GERMANY Telephone: (49) 69 83 06 0 FAX: (49) 69 83 06 555 www.vde.de **TUV Essen** (Headquarters) 2099 Gateway Place, Suite 200 San Jose, CA 95510 Telephone: (408) 441-7888 FAX: (408) 441-7111 www.tuvessen.com **TUV** Rheinland Of North America, Inc. (Headquarters) ***(NCB)*** 12 Commerce Road Newtown, CT 06470, U.S.A. Telephone: (203) 426-0888 FAX: (203) 270-8883 www.tuv.com **TUV** Rheinland Product Safety GmbH ***(NCB)*** Am Grauen Stein D-51105 Köln, GERMANY Telephone: (49) 221 806 01 FAX: (49) 221 806 3905 www.tuev-rheinland.de/product-safety/ **TUV** Product Service GmbH ***(NCB)*** Ridlerstrasse 31 D-80339 München, GERMANY Telephone: (49) 89 500 840 FAX: (49) 89 500 84230 www.tuvps.com **TUV** Product Service (U.S. Headquarters) 5 Cherry Hill Drive Danvers, MA 01923 Telephone: (978) 739-7065 or (800) TUV-0123 FAX: (978) 777-8441
GREECE				ELOT — The Hellenic Organiz. of Standardization ***(NCB)*** 313, Acharnon Street GR-11145 Athens GREECE Telephone: (30) 1 22 80 001 FAX: (30) 1 22 83 034 www.elot.gr
HUNGARY		MSZT Magyar Szabványügyi Testületl (Hungarian Office for Standardization) Üllöi út 25 PF. 24 H-1450 Budapest 9 HUNGARY Telephone: (36) 1 218 3011 FAX: (36) 1 218 5125 www.mszt.hu		MEEI — Magyar Elektrotechnikai Ellenorzo Intezet ***(NCB)*** (Hungarian Institute for Testing Electrical Equipment) Vácí út 48/a-b Pf. 441 H-1395 Budapest XIII HUNGARY Telephone (36) 1 49 55 61 FAX: (36) 1 129 06 84

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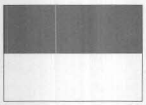
INDONESIA 	SII	BSN — Badan Standardisasi Nasional c/o Pusat Standardisasi — LIPI Jalan Jend. Gatot Subroto 10 Jakarta, 12710, INDONESIA Telephone: (62) 21 522 1686 FAX: (62) 21 520 6574		
IRAN	ISIRI	ISIRI — Institute of Standards and Industrial Research of Iran Box 31585-163 Karaj, IRAN Telephone: (98) 261 22 60 31 5 FAX: (98) 261 22 50 15		
IRELAND		Electro-Technical Council of Ireland Ballymun Road IE-Dublin 9, IRELAND Telephone: (353) 83 76 773 FAX: (353) 83 69 821 www.nasi.ie		NSAI — Nat. Standards Authority of Ireland ***(NCB)*** Glasnevin IRL-Dublin 9, IRELAND Telephone: (353) 1 807 3800 FAX: (353) 1 807 3838 www.nasi.ie NSAI of America 5 Medallion Ctr. (Greeley St.) Merrimack, NH 03054, USA Telephone: (603) 424-7070 FAX: (603) 429-1427
ISRAEL				SII — Standards Institution of Israel ***(NCB)*** 42 Chaim Levenon Str. IL-Tel Aviv 69977, ISRAEL Telephone: (972) 3 646 5154 FAX: (972) 3 641 9683 www.sii.org.il
ITALY		CEI Comitato Elettrotecnico Italiano (Italian Electrotechnical Comm.) Viale Monza 259 I-20126 Milano, ITALY Telephone: (39) 2 25 77 31 FAX: (39) 2 25 77 3222 www.ceiuni.it UNI Ente Nazionale Italiano di Via Battistotti Sassi 11/b I-20133 Milano, ITALY Telephone: (39) 2 70 02 41 FAX: (39) 2 70 10 61 49 www.unicei.it/uni/		IMQ ***(NCB)*** Instituto Italiano del Marchio di Qualitá Via Quintiliano, 43 I-20138 Milano, ITALY Telephone: (39) 2 5073 1 FAX: (39) 2 5073 271 www.imq.it

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JAPAN		All certification and test agencies are part of "MITI"— The Ministry of International Trade and Industry JIS — Japanese Industrial Standards Committee Agency of Industrial Science & Technology/MITI 1-3-1 Kasumigaseki 1-Chome Chiyoda-ku, Tokyo 100, JAPAN Telephone: (81) 3 35 01 2096 FAX: (81) 3 35 80 8637 www.aist.go.jp/jisc/htm/jisc00.htm *UL has information on MITI requirements. Contact:* UL International Compliance Services 1285 Walt Whitman Road Melville, New York 11747 Phone: (516) 271-6200 • FAX: (516) 271-8250 Japanese Standards Association Toraya Bldg. 6F 4-2-22 Akasaka Minato-ku JP - TOKYO 107-0052, JAPAN Telephone: (81) 3 5770 1576 FAX: (81) 3 5770 1593		JET — Japan Electrical Testing Laboratory 5-14-12 Yoyogi Shibuya-ku, Tokyo 151, JAPAN Telephone: (81) 3 466-9818 • FAX: (81) 3 468-9817 IECEE Council of Japan ***(NCB)*** c/o Japan Quality Assurance Organization 1-21-25 Kinuta Tokyo 157, JAPAN Telephone: (81) 3 3416 5551 FAX: (81) 3 3416 5561 Electrical Appliance Safety Office (same address as JIS) Phone: (81) 3 501-1511 • FAX: (81) 3 501-1836
KAZAKHSTAN		TELSET — Communications Equipment Certification Body Ul. Furmanova 242 Almaty, 480099 KAZAKHSTAN Telephone: (7) 3272 64 35 98 FAX: (7) 3272 54 23 60		
KENYA		**KEBS** — Kenya Bureau of Standards Off Mombasa Road Behind Belle Vue Cinema P. O. Box 54974, Nairobi, KENYA Telephone: (25) 4 2 50 22 10/19 FAX: (25) 4 2 50 32 93 www.kebs.org		
KOREA, DPR (NORTH)		Committee for Standardization Zung Gu Yok Seungli-Street Pyongyang DEMOCRATIC PEOPLE'S REPUBLIC OF KOREA Telephone: (85) 2 57 15 67		
KOREA, REP. OF (SOUTH)		KNITQ — Korean National Institute of Technology & Quality 1599 Kwangyand-dong Dongan-gu, Anyang-city KR - Kyonggi-do 431-060, REPUBLIC OF KOREA Telephone: (82) 343 84 1864 FAX: (82) 343 84 6077		IECEE Council of Korea ***(NCB)*** KAITECH — Korea Academy of Industrial Tech. 222-13, Guro-Dong, Guro-ku 152-053 Seoul, REPUBLIC OF KOREA Telephone: (82) 2 860 1400 FAX: (82) 2 860 1465
KYRGYZ REPUBLIC		State Inspectorate for Standardization & Metrology ul. Panfilov, 197 720040 Bishkek, KYRGYZ REPUBLIC Telephone: (7) 331 2 42 23 12 FAX: (7) 331 2 47 76 31		
LATVIA				Communications Dept. of Ministry of Transport 3 Gogol St. LV-1190 Riga, LATVIA Telephone: (371) 7 24 23 23 FAX: (371) 7 24 23 25
LITHUANIA		LST — Lithuanian Standards Board T. Kosciuskos g. 30 LT - 2600 Vilnius, LITHUANIA Telephone: (370) 2 70 93 60 FAX: (370) 2 22 62 52		

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LUXEMBOURG				Service de l'Energie de l'Etat (SEE) B.P. N° 10 LU - 2010, LUXEMBOURG Telephone: (35) 2 46 97 46-1 FAX: (35) 2 22 25 24 www.etat.lu/see
MALAYSIA		SIRIM — SIRIM Berhad No. 1 Persiaran Dato' Menteri Seksyen 2, 40000 Shah Alam Selangor Darul Ehsan, MALAYSIA Telephone: (60) 3 559 2601 FAX: (60) 3 550 8095 www.sirim.my		DSM — Department of Standards Malaysia 21st Floor, Wisma MPSA Persiaran Perbandaran MY - 40675 SHAH ALAM, SELANGOR, MALAYSIA Telephone: (60) 3 559 80 33 FAX: (60) 3 559 24 97 http://mastic.gov.my/kstas/dsm.htm
MEXICO	DGN	DGN — Dirección General de Normas Av. Puente de Tecamachalco No. 6 Col. Lomas de Tecamachalco Secc. Fuentes Naucalpan De Juarez, ESTADO DE MEXICO, C.P. 53950 Telephone: (52) 5 729 94 80 FAX: (52) 5 729 94 84		TUV — TUV Rheinland de Mexico, S.A. de C.V. Adolfo Prieto No. 815 1er Piso Colonia del Valle Mexico, D.F., MEXICO 03100 Telephone: (525) 687-4731 FAX: (525)687-2638 www.us.tuv.com ANCE Av. Puente de Tecamachalco No. 6 Edificio Anexo, Col. Fuentes de Tecamachalco Naucalpan de Juárez Edo. de Mexico, C.P. 53950 Telephone: (52) 5 520 9026 FAX: (52) 5 520 8800 http://rtn.net.mx/ance/
MOLDOVA		Communications & Informatics Stefan chel Mare Blvd, 134 277012 Chisinau, MOLDOVA Telephone: (373) 2 24 05 75 FAX: (373) 2 24 15 53		
NETHERLANDS		NEC — Nederlands Elektrotechnisch Comite Kalfjeslaan 2 Postbus 5059 NL-2600 GB Delft, THE NETHERLANDS Telephone: (31) 15 2 69 03 90 FAX: (31) 15 2 69 01 90 www.nni.nl	KEMA EUR	KEMA — NV tot Keuring van Elektrotechnische Materialen ***(NCB)*** Utrechseweg 310 Postbus 9035 NL-6800 ET Arnhem, THE NETHERLANDS Telephone: (31) 26 3 56 34 27 FAX: (31) 26 3 51 01 78 www.kema.nl
NEW ZEALAND	SANZ	SANZ — Standards New Zealand 155 The Terrace Private Bag 2439 6020 Wellington, NEW ZEALAND Telephone: (64) 4 498 59 90 FAX: (64) 4 498 59 94 www.standards.co.nz		
NORWAY		NEK — Norsk Elektroteknisk Komite (Norwegian Electrotechnical Committee) Habitzalléen24 Postboks 280 Skoyen N-0212 Oslo, NORWAY Telephone: (47) 22 52 69 50 FAX: (47) 22 52 69 61 www.standard.no	N	NEMKO — Norges Elektriske Materiellkontroll ***(NCB)*** Gaustadalleen 30 Postboks 73, Blindern N-0314 Oslo 3 NORWAY Telephone: (47) 22 960 330 FAX: (47) 22 960 550 www.nemk.no
PAKISTAN		Pakistan Standards Institution 39 Garden Road 74400 Saddar, Karachi 3 PAKISTAN Telephone: (92) 21 772 65 01 FAX: (92) 21 772 81 24		

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***(NCB)* = National Certification Body according to IEC CB Bulletin No. 928 March, 1988**

COUNTRY & MARK	STANDARD AGENCY SYMBOL	STANDARDS AGENCY	TEST AGENCY SYMBOL	TESTING AND/OR CERTIFICATION AGENCY
PHILIPPINES		Bureau of Product Standards (BPS) Trade and Industry Building 361 Sen. Gil J. Puyat Avenue PH - Makati City 1200, Metro Manila, PHILIPPINES Telephone: (63) 2 890 4965 FAX: (63) 2 890 4926		
POLAND		Polski Komitet Normalizacji Miar i Jakosci Polish (Committee for Standardization, Measures and Quality Control) ul. Elektoralna 2 00-950 Warszawa, POLAND Telephone: (48) 22 620 54 34; FAX: (48) 22 620 54 34	B	PCBC — Centre for Testing & Certification ul. Klobucka 23 A PL-02-699 Warszawa, POLAND Telephone: (48) 22 6470 742 FAX (48) 22 6471 222
PORTUGAL		CEP — Comissão Electrotécnica Portuguesa Portuguesa Rua Infantaria 16, n°41-2° 1200 Lisbon, PORTUGAL Telephone: (351) 681048-681049		IPQ — Instituto Portugués da Qualidade ***(NCB)*** Rua C á Avenida dos Três Vales P-2825 Monte de Caparica, PORTUGAL Telephone: (351) 1 294 81 00; FAX: (351) 1 294 81 01 www.ipq.pt
ROMANIA		IRS —Institutul Roman de Standardizare (Romanian Standards Institute) Str. Jean-Louis Calderon Nr. 13 Cod 70201 2 Bucuresti, ROMANIA Telephone: (40) 1 211 32 96; FAX: (40) 1 210 08 33		
RUSSIAN FED				Gost Re ***(NCB)*** Gosstandart of Russia 9 Leninsky pr. RU - 117049 Moscow M-49, RUSSIAN FEDERATION Telephone: (7) 095 236 40 44 FAX: (7) 095 237 60 32 www.gost.ru
SAUDIA ARABIA		SASO — SAUDIA ARABIAN STANDARDS ORGANIZATION P.O. Box 3437 Riyadh 11471, KINGDOM OF SAUDIA ARABIA Telephone: (966) 1 452 00 00 FAX: (966) 1 452 00 86 www.saso.org		
SINGAPORE		PSB — Productivity and Standards Board ***(NCB)*** 1 Science Park Drive Singapore 118221, REPUBLIC OF SINGAPORE Telephone: (65) 278 66 66 FAX: (65) 278 66 65 www.psb.gov.sg		
SLOVAKIA		SUTN — Slovak Institute for Standardization Karloveska 63 SK - 842 45 Bratislava, SLOVAKIA Telephone: (421) 7 794 467 FAX: (421) 7 363 751		UNMS — Slovak Office of Standards, Metrology & Testing Stefanovicova 3, P. O. Box 76 SK - 810 05 Bratislava, SLOVAKIA Telephone: (421) 7 394 728 FAX: (421) 7 391 050 EVPÚ a.s. ***(NCB)*** Trencianska 19 01851 Nova Dubnia, SLOVAKIA Telephone: (421) 827 409 223 FAX: (421) 827 247 50
SLOVENIA		SMIS — Standards and Metrology Institute of the Republic of Slovenia Kotnikova 6 SI - 1000 Ljubljana, SLOVENIA Telephone: (386) 61 178 3000 FAX: (386) 61 178 3196 www.usm.mzt.si		SIQ — Slovenian Institute of Quality and Metrology Trzaska cesta 2 61000 Ljubljana, SLOVENIA Telephone: (386) 61 1778 100 FAX: (386) 61 1778 444

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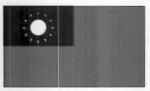
		Kistagången 19, Box 1284 SE-16429 Kista-Stockholm, SWEDEN Telephone: (46) 8 444 14 00 FAX: (46) 8 444 14 30 www.sekom.se		Torshamnsgatan 43, Box 1103 S-164 22 Kista-Stockholm, SWEDEN Telephone: (46) 8 750 00 00 FAX: (46) 8 750 60 30 www.semko.se
SWITZERLAND 		SNV — Swiss Association for Standardization ***(NCB)*** Mühlebachstrasse 54 CH-80087 Zurich, SWITZERLAND Telephone: (41) 1 254 54 54 FAX: (41) 1 254 54 74 www.snv.ch		SEV — Swiss Electrotechnical Association ***(NCB)*** Luppmenstrasse 1 CH-8320 Fehraltorf, SWITZERLAND Telephone: (41) 1 956 12 12 FAX: (41) 1 956 12 22 www.sev.ch Federal Inspectorate for Heavy Current Installations ESTI ***(NCB)*** Luppmenstrasse 1 CH-8320 Fehraltorf, SWITZERLAND Telephone: (41) 1 956 12 12 FAX: (41) 1 956 12 22 www.sev.ch
TAIWAN 		BCIQ — Bureau of Commodity Inspection and Quarantine Ministry of Economic Affairs, Republic of China 4, Section 1, Chinan Road Taipei, TAIWAN ROC Telephone: (886) 2 351-2141; FAX: (886) 2 393-2324 www.moeabciq.gov.tw		
TAJIKISTAN 		Ministry of Posts & Telecommunications Rudaki Prospect, 57 734025 Dushanbe, TAJIKISTAN Telephone: (7) 377 2 21 77 08 FAX: (7) 377 2 21 29 53 Ministry of Posts & Telecommunications ul. Zhitnikov, 36 Ashgabat, TURKMENISTAN Telephone: (7) 3632 35 4020 FAX: (7) 3632 39 0420		
THAILAND 		TISI — Thai Industrial Standards Institute Ministry of Industry Rama VI Street TH - 10400 Bangkok, THAILAND Telephone: (66) 2 202 35 01 FAX: (66) 2 247 87 41 www.tisi.go.th		

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TURKEY		Türk Standardlari Entitüsü Necatibey Caddesi, 112 TR - 06100 Bakanliklar / Ankara, TURKEY Telephone: (90) 312 417 83 30 FAX: (90) 312 425 43 99 www.tse.org.tr		
UKRAINE		DSTU — State Commitee for Ukraine for Standardization, Metrology and Certification GSP Kiev-6, 252650, UKRAINE Telephone: (380) 44 226 29 71 FAX: (380) 44 228 29 70		Derjstandart of Ukraine ***(NCB)*** 174, Gorkiy St. UA - 252006, GSP, Kiev-6, UKRAINE Telephone: (380) 44 226 29 71 FAX: (308) 44 26 2970
UNITED KINGDOM		BSI — British Electrotechnical Committee ***(NCB)*** 389 Chiswick High Road London W4 4AL, UNITED KINGDOM Telephone: (44) 181 996 9000 FAX: (44) 181 996 7799 www.bsi.org.uk		BSI — Product Certificaiton ***(NCB)*** P.O. Box 375 Milton Keynes MK14 6LL, UNITED KINGDOM Telephone: (44) 1 908 312 636; FAX: (44) 1 908 695 157 www.bsi.org.uk BEAB — British Electrotechnical Approvals Board ***(NCB)*** 1 Station View Guilford, Surrey GU1 4JY, UNITED KINGDOM Telephone: (44) 1 483 455 466; FAX: (44) 1 483 455 477 www.beab.co.uk BASEC — British Approvals Service for Electric Cables Maylands Ave., Hemel Hempstead Herts HP2 4SQ, UNITED KINGDOM Telephone: (44) 1908 31 55 55; FAX: (44) 1908 32 08 56 ASTA — Certification Services ***(NCB)*** ASTA House, Chestnut Field Rugby CV21 2TL, UNITED KINGDOM Telephone: (44) 01788 578 435; FAX: (44) 01788 573 605
UNITED STATES OF AMERICA		ANSI — American National Standards Institute 11 W. 42nd Street New York, NY 10036 Telephone: (212) 642-4900 FAX/sales: (212) 398-0023 www.ansi.org NEMA — National Electrical Manufacturers Association 1300 North 17th St. Suite 1847 Rosslyn, VA 22209 Telephone: (703) 841-3258 FAX: (703) 841-3344 www.nema.org		Intertek Testing Services, N.A., Inc. ***(NCB) (NRTL)*** 3933 US Rte. 11, Industrial Park Cortland, NY 13045 Telephone: (607) 753-6711 FAX: (607) 756-6699 www.etl.com Canadian Standards Association ***(NCB) (NRTL)*** 178 Rexdale Blvd. Etobicoke (Toronto), Ontario M9W 1R3, CANADA Telephone: (416) 747 4000 FAX: (416) 747 4149 www.csa.ca Factory Mutual Insurance Co. ***(NCB) (NRTL)*** P. O. Box 9102 1151 Boston-Providence Turnpike Norwood, MA. 02062 Telephone: (617)762-4300 FAX: (617) 762-9375 www.factorymutual.com MET — MET Laboratories, Inc. ***(NCB)*** 916 W. Patapsco Avenue Baltimore, MD 21230 Telephone: (410) 354-3300 FAX: (410) 354-3313 www.metlabs.com TUV Rhineland of North American, Inc. ***(NCB) (NRTL)*** 12 Commerce Road Newtown, CT 64070 Telephone: (203) 426-0888 FAX: (203) 270-8883 -See also "Germany"

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		(United States, continued)		UL — Underwriters Laboratories, Inc. ***(NCB) (NTRL)*** 333 Pfingsten Road Northbrook, IL 60062 Telephone: (847) 272-8800 FAX: (847) 272-9562 www.ul.com Other UL offices: 1655 Scott Blvd. Santa Clara, CA 95050 Telephone: (408) 985-2400 FAX: (408) 296-3256 1285 Walt Whitman Road Melville, NY 11747 Telephone: (516) 271-6200 FAX: (516) 271-8259 12 Laboratory Drive P. O. Box 13995 Research Triangle Park, NC 27709 Telephone: (919) 549-1400 FAX: (919) 547-6000 2600 N.W. Lake Road Camas, WA 98607 Telephone: (360) 817-5500 FAX: (360) 817-6000 Demko A/S P. O. Box 514 Lyskaer 8 DK - 2730 Herleu, DENMARK Telephone: (45) 44 85 65 65 FAX: (45) 44 85 65 00 www.demko.dk
URUGUAY		UNIT — Instituto Uruguayo de Normas Tecnicas Piso 7, Galeria Elysée San José 1031 UY - 11100 Montevideo, URUGUAY Telephon: (598) 2 92 1680 FAX: (598) 2 92 1681		
UZBEKISTAN		UZ Gost Uzbeck State Center for Standardization, Metrology and Certification Ulitsa Farobi, 333-A 700049 Tachkent, UZBEKISTAN Telephone: (7) 371 246 17 10 FAX: (7) 371 246 17 11		
VENEZUELA		CODELECTRA en Conjunto con COVENIN Avda. Ppal. Las Mercedes-Edf. Centro Victorial-Piso 1 Caracas 1060 VENEZUELA Telephone: (58) 91 99 06		COVENIN - Ppal. Comis. Venezolana de Normas Industriales Av. Boyaca (COTA MIL) Edf. Fundacion La Salle, 5° Piso Caracas 105, VENEZUELA

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COUNTRY & MARK	STANDARD AGENCY SYMBOL	STANDARDS AGENCY	TEST AGENCY SYMBOL	TESTING AND/OR CERTIFICATION AGENCY
YUGOSLAVIA (The Fed. Rep. of two states: Montenegro & Serbia)				SZS — Federal Institution for Standardization ***(NCB)*** Department of Quality Kneza Milosa 20 YU - 11000 Belgrade Telephone: (381) 11 65 75 23 FAX: (381) 11 23 51 036
INTERNATIONAL		IEC Central Office of the IEC P. O. Box 131 3, rue de Varembé CH-1211 Geneva 20 SWITZERLAND Telephone: (41) 22 919 02 11 FAX: (41) 22 919 0300 www.iec.ch CENELEC Comité Européen de Normalisation Electrotechnique Rue de Stassart, 35 B-1050 Brussels, BELGIUM Telephone: (32) 2 519 68 71 FAX: (32) 2 519 69 19 www.cenelec.be		

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Guide to International Standards Publications

The following is a list of standards, publications, and other resources that may be of use to the International Design Engineer. Major sources of documents and publications which we believe are pertinent to the Panel Components Corporation product line are also noted.

American Electronics Association (AEA), Washington D.C. Office, 601 Pennsylvania Avenue, N.W., North Building, Suite 600, Washington, DC 20004. Telephone: (202) 682-9110. Fax: (202) 682-9111.

Santa Clara Office, 5201 Great America Parkway, Santa Clara, CA 95054-1120. Telephone: (408) 987-4280. Fax: (408) 986-1247. American Electronics Association is an association for the high-tech industry.

ANSI, American National Standards Institute, 11 West 42nd Street, New York, NY 10036. Telephone: (212) 642-4900. Fax for sales office: (212) 302-1286 (main Fax is 212/398-0023). www.ansi.org. ANSI is an organization composed of many special working groups that concentrate on particular technical areas. U.S. representation at the IEC is organized through ANSI. In addition, ANSI is a major distributor of North American and international publications, such as VDE, DIN, IEC and others.

BSI, the British Standards Institution. BSI is a major information source, offering a special division called the Technical Help to Exporters ("THE") and Technical Information Group. Both BSI and THE offer excellent reference materials on electrical and electronic standards worldwide. In addition, they have translated many foreign standards into English which are available for purchase. For information, contact British Standards House, 389 Chiswick High Road, London W4 4AL, United Kingdom. Telephone (44) 0181 996 9000. Fax: (44) 0181 996 7400. www.bsi.org.uk.

Specific phone numbers for THE and Technical Information: Telephone for Electrical Engineering: (44) 0181 996 7021. Telephone for Mechanical Engineering: (44) 0181 996 7024. Fax for THE and Technical Information: (44) 0181 996 7048.

Suggested BSI/THE references:

BS 546: This standard describes a grounded plug system with three round contacts oriented in triangular geometry. BS 546 specifies three different connectors for ratings of 2, 5 and 15 amps. These connectors are not intermateable because both contact diameters and spacing increase with the increasing current rating. BS 546 is being replaced by BS 1363. However, the 15 amp rated connector, currently the basis for the Indian standard, is used in several African countries, and in Malaysia on air conditioning units. In the PCC Catalog & Designer's Reference, this type of plug is referred to as the "Old British" system.

BS 1362: Defines the parameters for a fuse that is installed in all British plugs conforming to BS 1363 (see below).

BS 1363: This standards document describes a grounded primary power connector system with solid rectangular contacts. The plug is always fused, and the rating is 13 amps. This is the current British standard, and it is used in countries like Malaysia for circuits rated up to 13 amps.

BS 4491: This standard describes appliance connectors for household and similar general purposes. Several amendments to this standard have been published. Parts of this standard have been replaced by EN 60320.

BS 6500: Standard on insulated flexible cords. Cross reference with IEC 60227, CENELEC HD21 and 22.

CB: See IECEE - CB Scheme

CEE: See IECEE - CB Scheme

CEN/CENELEC, Comité Européen de Normalisation Electrotechnique (European Committee for Electrotechnical Standardization), Rue de Stassart, 35, B-1050 Brussels, Belgium, Telephone: (32) 2 519 6871. Fax: (32) 2 519 6919.

The CEN/CENELEC member countries include Austria, Belgium, Denmark, Finland, France, Germany, Greece, Iceland, Ireland, Italy, Luxembourg, the Netherlands, Norway, Portugal, Sweden, Spain, Switzerland, and the United Kingdom. The goal of CEN/CENELEC is to remove trade barriers among its members. After a very complicated standards writing process, which usually revolves around existing IEC standards, an EC Directive is issued. This results in documents called "ENs" (European Norms) and "HDs" (Harmonizing Documents). All members are required to accept their use, instead of their own national standards. One special certification scheme for cables and cords illustrates the effect very well. When cable and cordage is certified and marked HAR, it is mandatory for all member countries to accept its use, regardless of what member country actually did the certifying. Thus, a trade barrier is removed.

Suggested CENELEC references:

Note: European Standards may be purchased from ANSI or BSI.

EN ISO 9000: International Quality Management & Quality Assurance Series.

EN 60127: Miniature fuses.

EN 60335: Safety of household or similar electrical appliances.

EN 60950: Safety of Information Technology Equipment.

EN 61010: Safety requirements for electrical equipment for measurement, control and laboratory use.

HD-21: The harmonized standard for PVC insulated cables and flexible cords with rated voltage up to and including

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450/750 V.

HD-22: Harmonized document for rubber insulated cables and flexible cords with rated voltage up to and including 450/750 V.

HD-472-S1: Nominal Voltages for Public Low Voltage Distribution. Standardizes on 230V for 2 & 3 wire products, 400V for 4 wire.

CSA, The Canadian Standards Association, 178 Rexdale Blvd., Etobicoke (Toronto), Ontario, Canada M9W 1R3. Telephone: (416) 747- 4000. Fax: (416) 747-4149 www.csa.ca.

Suggested CSA references:

Canadian Standards Association Catalog, published yearly and available directly from CSA.

C22.2 No. 0: General Requirements Canadian Electrical Code Part II.

C22.2 No. 0.3: Test Methods for Electrical Wires and Cables

C22.2 No. 0.4: Bonding and Grounding of Electrical Equipment (Protective Grounding)

C22.2 No. 8: Electromagnetic Interference (EMI) Filters

C22.2 No. 14: Industrial Control Equipment for Use in Ordinary (Non-Hazardous) Locations

C22.2 No. 21: Cord Sets and Power Supply Cords

C22.2 No. 31: Switchgear Assem., Industrial Products

C22.2 No. 39: Fuseholder Assemblies

C22.2 No. 42: General Use Receptacles, Attachment Plugs, and Similar Wiring Devices

C22.2 No. 49: Flexible Cords and Cables

C22.2 No. 59.1: Fuses (Both Plug and Cartridge-Enclosed Types)

C22.2 No. 59.2: Supplemental Fuses

C22.2 No. 94: Special Purpose Enclosures

C22.2 No. 601: Medical Electrical Equipment

C22.2 No. 158: Terminal Blocks

C22.2 No. 182.1: Industrial Type Special Use Attachment Plugs, Receptacles, and Connectors

C22.2 No. 182.2: Industrial, Locking Type Special Use Attachment Plugs, Receptacles, and Connectors

C22.2 No. 182.3: Special Use Attachment Plugs, Receptacles, and Connectors

C22.2 No. 220: Information Processing and Business Equipment.

C22.2 No. 950: Safety of Information Technology Equipment.

Compliance Engineering Magazine, 70 Codman Hill Road, Boxborough, MA 01719. Telephone: (978) 635-8580. Fax: (978) 635-8599. www.ce-mag.com

DEMKO A/S, Lysjaer 8, DK-2730 Herlev, Denmark, is the Danish testing agency. Telephone: 45 44 85 6565. Fax: 45 44 85 6500. www.demko.dk.

Suggested DEMKO references:

List of electrical equipment approved for use in Denmark with an index in English.

Afsnit 107: The Danish Standards: "Household Plugs and Plugs for Special Danish Systems, Part 107."

DIN, Deutsches Institut für Normung (German Standardization Institute). Burggrafenstrasse 6, D-10787 Berlin, Germany. DIN does not perform any testing. Telephone: 49 30 26 010.

Fax: 49 30 26 01 231. www.din.de.

Suggested DIN references:

DIN 41571: 5 x 20 mm quick-acting, low- and medium-time and time-lag fuse-links.

DIN 41660: 5 x 20 mm quick-acting, high-breaking capacity fuses.

DIN 41661: 5 x 20 mm quick-acting, low-breaking capacity fuses.

DIN 41664: Describes a German standard post-type fuseholder with a screw cap.

DIN 41669: Fuseholders.

DIN 46244: Equipment-mounted male quick disconnect.

DIN 46247: Uninsulated female quick disconnect for sizes 4.8, 6.3 and 9.5 mm.

DIN 46248: 6.3 mm uninsulated male quick disconnect.

DIN 46249: Uninsulated male quick disconnect.

DIN 46330: Uninsulated short female quick disconnect.

DIN 46342: Straight and angle locking male quick disconnect.

DIN 46345: Female quick disconnect with male quick disconnect for 6.3 mm size.

DIN standards are primarily available in German; however, translations of both standards and lists of standards are available in English from BSI/THE, Global Engineering Documents and VDE. (See each as they appear in alphabetical order for contact information.)

European Directives:

Council Directive (93/68/EEC) amending such directives as the low voltage and EMC Directives

Conformity Assessment and Rules for Affixing the CE Mark (Council Decision 93/465/EEC)

Electromagnetic Compatability (EMC) Directive (89/336/EEC)

Low Voltage Directive (73/23/EEC)

Machinery Directive (89/392/EEC)

Medical Device Directive (93/42/EEC)

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Product Safety Directive (92/59/EEC)

Product Liability Directive (85/374/EEC)

Telecommunications Terminal Equipment (91/263/EEC)

Toys (88/378/EEC, Amended by 93/68/EEC)

To obtain Euopean Directives contact:

European Document Research, Official Agents of the Office for Official Publications of the European Communities, 1100 17th Street. N.W., Suite 301, Washington, DC 20036. Telephone: (202) 785-8594. Fax: (202) 785-8589.

EuroPort, P. O. Box 378, 66 Summer Street, Manchester, MA 01944. VDE, IEC, EN, ISO standards in English. Telephone: (978) 526-1687. Fax (978) 526-7118.

Global Engineering Documents (div. of Information Handling Services), 15 Inverness Way East, Englewood, CO 80112. Source for UL, VDE, DIN, British standards, ISO, and other international agency documents. Telephone: (800) 854-7179. Fax: (303) 397-2740.

IEC. The International Electrotechnical Commission. 3, Rue de Varembe, CH-1211, Geneva 20, Switzerland. Telephone: (41) 22 919 02 11. Fax: (41) 22 919 03 00. www.iec.ch.

IEC writes and distributes consensus standards created through an elaborate network of world wide committees made up of experts in the areas of concern. In effect, an IEC standard is a treaty, signed by many nations to foster international standardization. The standards on electrical products and components include references to safety and performance. The IEC does not perform any testing; this function is left to the national testing agencies. National standards are frequently based on IEC publications. Inquiries regarding IEC standards may also be made to the U.S. National Committee of the IEC, American National Standards Institutes (see previous reference to ANSI for address).

Suggested IEC references:

Note: When ordering IEC publications, always request a list of all amendments and supplements. Sometimes they will be quite detailed, so carefully check what you need before ordering.

IEC Catalog of Publications

IEC Multilingual Dictionary of Electricity

IEC 60065: Audio, Video and Similar Electronic Apparatus - Safety Requirements.

IEC 60068-2-7: Concerns basic environmental testing procedures for electronic components and electronic equipment. Section 2-6 refers to vibration tests.

IEC 60083: "Plugs and Sockets for Domestic and Similar Use."

IEC 60127: "Cartridge Fuse-Links for Miniature Fuses." Several supplements have been published.

IEC 60227: "Polyvinyl Chloride Insulated Cables of Rated Voltages Up To and Including 450/750 V."

IEC 60228: "Conductors of insulated cables."

IEC 60245: "Rubber Insulated Cables of Rated Voltages up to and including 450/750 V."

IEC 60269: "Low Voltage Fuses."

IEC 60291: "Fuse Definitions."

IEC 60309: "Plugs, Socket-Outlets and Couplers for Industrial Purposes." (High power connectors)

IEC 60320: "Appliance Couplers for Household and Similar General Purposes."

IEC 60384-14: "Sectional Specification: Fixed Capacitors for ElectromagneticInterference Suppression. Selection of Methods of Test and General Requirements." Supersedes IEC 161 (1965).

IEC 60417: "Graphic Symbols for use on Equipment"

IEC 60529: "Classification of Degrees of Protection by Enclosures."(IP Code System)

IEC 60536: "Classification of Electrical and Electronic Equipment with Regard to Protection Against Electric Shock."

IEC 60601-1: "Safety of Medical Electrical Equipment, Part 1: General Requirements."

IEC 60664: "Insulation Coordination Within Low-Voltage Systems."

IEC 60799: "Cord sets."

IEC 60811: "Test Methods for Insulating and Sheathing of Electric Cables."

IEC 60947: Low Voltage Switchgear and Control Gear.

IEC 60950: "Safety of Information Technology Equipment including Business Equipment."

IEC 61058: "Switches for Appliances."

IECEE – CB Scheme is the same as the old CEE – CB Scheme that issued CEE standards. This is a world-wide program for reciprocal recognition of safety testing results of electrical equipment, among participating countries. Over 30 countries now have membership on the IECEE, including Japan, all members of CEN/CENELEC, the USSR, and some Eastern European countries.

The IECEE is headquartered at the IEC, in Geneva (see IEC for address). A bulletin covering many issues including national deviations from the IECEE standards is available from the IEC.

Suggested IECEE – CB reference (Note: Most CEE publications have been superseded by more recently published IEC documents, however there continues to be a mixture of CEE and IEC standards in use.)

IECEE organizational documentation:

IECEE Nr. 1, Basic rules and rules of procedure of the system.

IECEE Nr. 2, Rules and procedures of the scheme of the IECEE for

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the recognition of results of testing to standards for safety of electrical equipment (CB Scheme)

Categories of products covered by the IECEE-CB Scheme and suggested IECEE references appear below. Note: items in parentheses ( ) are standard, not yet in CB Scheme, or have been abandoned.

Category	CEE Standard Used	IEC
Cables and Cords	–	227
	–	245
	–	799
Capacitors as Components	–	252, 384, 939, 1048
Switches for appliances, automatic controls & household appliances	24	(691) 730, 934, 1058, 1095
Household & Similar Equipment	(10, 11)	335, 342, 967
Installation Accessories & Connection Devices	7	–
		884, 998
	–	423, 1011
	–	439, 1210
	–	614, 670
	–	669, 974, 1242
Lighting	–	901, 928, 1199
	–	920, 968
	–	921, 1046
	–	922, 1050
	–	924
	–	926, 1195
Measuring Instruments	–	414, 1010
Electrical Equip. for Medical Use	–	601
IT & Office Equipment	–	950
Low Voltage, High Power switching Equipment	–	(158) 947
Installation Protective Equipment	–	127, (257) 269, 691, 898, 1008, 1009,
	–	529
	(27)	755
Safety Transformers & Similar Equipt.	15	742
Portable Tools	(20)	745, 1029
Electronics, Entertainment	–	65, 491

Further details about current and superseded CEE documents covering products exhibited in this catalog:

CEE 7: Specification for plugs and socket-outlets for domestic and similar purposes.

CEE 7-4: Describes a plug and socket combination rated at 10/16 amps, 250 volts, depending on country. It consists of two poles with grounding contacts mounted on the sides of the connectors. It is therefore not polarized. It is the standard used in Germany, Austria, the Netherlands, Norway, Sweden and Finland.

CEE 7-7: Describes a power plug which is essentially identical to that described in CEE Publication 7-4, except that it has a dual grounding system. In addition to the side contacts, there is a female contact on the plug which will accept the male grounding contact found in power outlets (sockets) used in France and Belgium. The CEE 7-7 plug may be used in all of the countries listed above as users of the CEE 7-4, as well as in Belgium and France.

CEE 13: A specification for polyvinyl-chloride-insulated cables and flexible cords; now superseded by HD-21 and HD-22, published by CENELEC (and IEC 227/245)

CEE 17: Specification for plugs and socket-outlets for industrial purposes.

CEE 22: A specification for appliance connectors for domestic and similar general purposes. The CEE-22 connector is the most commonly used international primary circuit connector for use with detachable cordsets. This standard has been superseded by IEC 320.

International Product Safety News: IPSN is a subscription newsletter focusing on product safety compliance. It features news, information, and resources of agencies such as UL, CSA, VDE, IEC, NRTLs and TUV. International Product Safety News, P. O. Box 1561W, Middletown, CT 06457-8061. Telephone: (860) 344-1651. Fax (860) 346-9066. www.safetylink.com.

ISO: International Standards Organization, Case Postale 56, 1211 Geneva 20, Switzerland. Telephone: (41) 22 749 01 11. Fax (41) 22 733 34 30. www.iso.ch.

ISO 9000 Series of Standards: International Quality Management & Quality Assurance. Also known as EN ISO 9000.

ISO 9241: A 13 part standard for ergonomics (Human Factors) of equipment. Also known as EN ISO 9241. This controls requirements like markings on switches, labels, product color and many other design aspects dealing with human factors. (American version is ANSI-ASQC Q9—available from ANSI.)

ISO 14001: Environmental Managment Systemns. Also known as EN ISO 14001.

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Liability Risk and Insurance is a newsletter that is focused entirely on international aspects of product liability. For information, contact Lloyd's of London Press Ltd., Sheepen Place, Colchester, Essex, England C03 3LP. Telephone: (44) 1 206 772 113. Fax (44) 1206 772 771. Ref. No. ISSN 0960-099X. www.iiplimited.com.

SA, Standards of Australia, P. O. Box 1055, Strathfield, NSW 2135, Australia. The SA writes standards for Australia. It does not perform any testing. Telephone: (61) 2 746 4900. Fax: (61) 2 746 8460.

Suggested SA references:

"Australian Standards," SA catalog

SA Standards:

AS 3100: Approval and Test Specifications for Definitions and General Requirements for Electrical Materials & Equipment.

AS 3112: Approval /Test Specifications for Plugs & Plug Sockets.

AS 3191: Electric Flexible Cords.

AS 3260: Safety of Information Technology Equipment

AS 3302: Particular Requirements for Electric Fans.

SNZ, Standards New Zealand, 155 The Terrace Private Bag 2439, 6020 Wellington, New Zealand. Mail: "Private Bag, Wellington." Telephone: (64) 4 498 59 90. Fax: (64) 4 498 59 94. www.standards.co.nz.

Suggested SNZ references:

New Zealand Standards current Catalogue lists standards.

Standards magazine, published monthly.

New Zealand Buyers Guide includes a list of products that carry the New Zealand certification mark.

SEMKO, Box 1103, S-164-22, Kista-Stockholm, Sweden. SEMKO is the national testing agency of Sweden. Telephone: (46) 8 750 00 00. Fax: (46) 8 750 60 30. www.semko.se.

Suggested SEMKO references:

A list of approved electrical equipment and a list of SEMKO test specifications (both in Swedish) are available from SEMKO.

T.H.E., Technical Help to Exporters, British Standards Institution, London, England. (See "B.S.I.") T.H.E. is part of the British Standards Institution. A major English-language information source, T.H.E. publishes a wide range of English translations of international standards, surveys of international requirements in specific areas, and a regular newsletter.

Suggested T.H.E. references:

T.H.E. Publications Catalogue.

T.H.E. Technical Export News, pub. quarterly for subscribers.

Fuses – A Multinational Survey

Electric Plugs – An International Survey

Germany: "Electrical Equipment Certification in the Federal Republic of Germany"

Europe: "Data Processing and Allied Equipment"

International: "World Electricity Supplies Booklet"

"Standards Marks"

Equipment Safety - An International Survey

"World Electricity Supplies" wall chart, updated every few years

UL, Underwriters Laboratories, Inc., 333 Pfingsten Road, Northbrook, IL 60062. Telephone: (847) 272-8800. Fax: (847) 272-9562. www.ul.com.

UL is a testing agency in the United States with headquarters at Northbrook, Illinois, and additional testing facilities at Santa Clara, California; Melville, New York; Research Triangle, North Carolina; Camas, Washington; and in Denmark (DEMKO A/S).

UL maintains a Client Advisor office at each facility. They will guide you on all of your UL safety compliance needs. UL publishes an annual "Standards for Safety" catalog of publications of standards and proposed editions of new standards. Informative brochures on UL are available such as "Testing for Public Safety" on the organization, purposes, procedures and services of UL. Individual UL standards are published separately (see below).

UL standards are available from Global engineering documents.

Suggested UL references:

The Directory of Recognized Components, in 3 volumes

UL 62: Flexible Cord and Fixture Wire

UL 94: Tests for Flammability of Plastic Materials

UL 98: Enclosed Switches

UL 114: Safety of Office and Business Equipment.

UL 198G: Fuses for Supplementary Overcurrent Protection

UL 498: Attachment Plugs and Receptacles

UL 512: Fuseholders

UL 544: Medical and Dental Equipment (will be replaced by UL 2601)

UL 746: Polymeric Materials

UL 796: Printed-Wiring Boards

UL 817: Cord Sets and Power Supply Cords

UL 1054: Special-Use Switches

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UL 1077: Supplementary Protectors for Use in Electrical Equipment

UL 1244: Electrical and Electronic Measuring and Testing Equipment

UL 1283: Electromagnetic Interference Filters

UL 1459: Telephone Equipment

UL 1581: Reference Standard for Electrical Wires, Cables, and Flexible Cords

UL 1950: Safety of Information Technology Equipment

UL 2601: Medical Electrical Equipment

U.S. Department of Commerce, Office of European Community Affairs, International Trade Administration, Rm H-3036, Washington D.C. 20230. Telephone: (202) 482-2000. Source of much national and international data. The International Trade Administration Office of Export Promotion is a division of the U.S. Department of Commerce which specifically offers assistance to businesses interested in exporting their products.

Suggested references from the Department of Commerce:

"Electric Current Abroad," a booklet describing plug and socket patterns in use throughout the world based on a survey of U.S. consulates abroad.

"U.S Industrial Outlook," published annually

"Foreign Business Practices, Materials on Practical Aspects of Exporting, International Licensing and Investing."

VDE, Verband Deutscher Electrotechniker, is the German national testing agency. VDE issues standards in the form of regulations (VDE-Bestimmungen), leaflets (VDE Druckschriften), instructions (VDE Merkblaetter), and guiding principles (VDE Richtlinien).

Detailed information on the respective conditions to be complied with in the case of approval tests and test reports, the submission of applications, etc. may be obtained free from VDE-Prufstelle, Merianstrasse 28, D-6050, Offenbach am Main, Germany. Telephone: (49) 69 8306 0. Fax: (49) 69 8306 555. www.vde.de

Suggested VDE references:

Annual VDE catalog (written in German)

Annual VDE Catalog: "English Translations of VDE Specifications"

0250: Part 1: Specification for cables and flexible cords.

0281: Part 1: Specification for PVC cables and flexible cords used in power installations.

0282: Part 1: Specification for rubber insulated cables and flexible cords used in power installations.

0411: Laboratory Equipment (Also EN 61010).

0550: Regulations for small transformers—"General regulations" (Also VDE 0552 and EN 61558).

0551: Isolating and safety isolating transformers (Also EN 60742).

0565: Specification for radio suppression devices. Radio interference suppression filters up to 16 A. (Also EN 13300 and EN 133200).

0620: Specification for plugs, socket-outlets, couplers and connectors. (Also IEC 884).

0625: Specifications for appliance couplers up to 250 V and 16 A (Also EN 60320).

0630: Electronic Switches (Also EN 61058, VDE 0600, EN 60947).

0632: Switches (Also EN 60699, VDE 0637).

0636: Low voltage fuses.

0642: Circuit breakers for equipment (Also EN 60934).

0700: Household and similar appliances (Also EN 60335, EN 50165, VDE 0722, 0725, 0730, 0740, 0741, 0791).

0750: Medical electrical equipment. (Also EN 60601).

0805: Telecommunication and information processing equipment (Also 0804, EN 60950).

0820: Specifications for miniature cartridge fuses and fuseholders (Also EN 60127).

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Cordage Recommendations

European "Harmonized" Cordage

CENELEC publications HD-21 and HD-22 outline construction of PVC jacketed and rubber-jacketed cordage respectively.

HD-21 recommendations for PVC jacketed cordage:

H05VV-F...(rated 300/500V): Ordinary PVC sheathed flexible cable for use in offices, domestic premises, kitchens, for medium duties, i.e., washing machines, spin dryers, refrigerators. Permitted for cooking and heating appliances, providing that cable is not in contact with hot parts and is not subject to radiation, etc. *(NOT suitable for outdoor use.)*

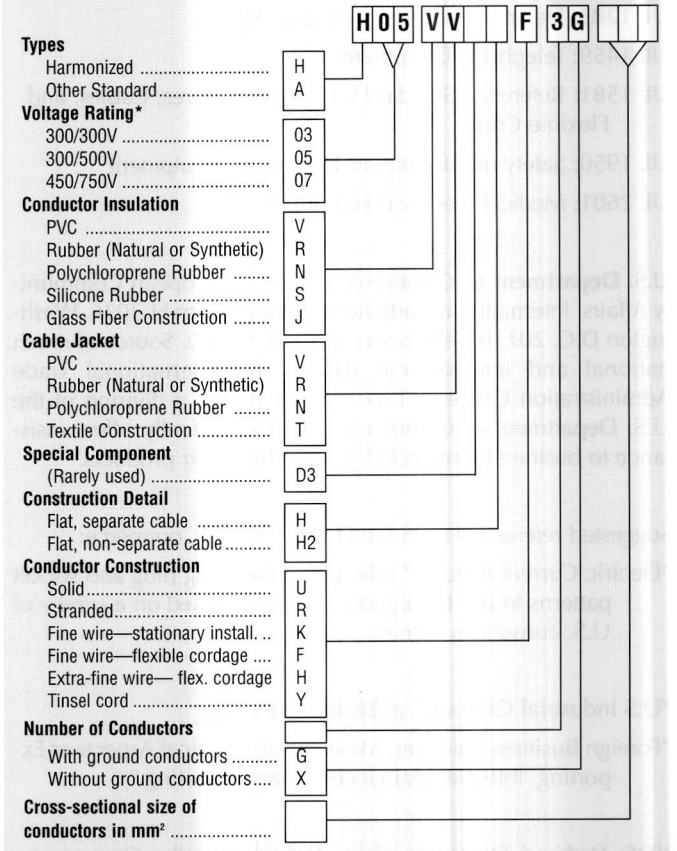
HD-22 recommendations for rubber jacketed cordage:

H05RN-F...(rated 300/500V): This is flexible rubber insulated cable intended for connecting lightweight hand and portable equipment subjected to low mechanical stresses in an open air environment, e.g., as connection leads for outdoor appliances, and in workshops. Not suited for use in agricultural applications or where there is risk of fire or explosion.

H07RN-F...(rated 450/750V): This is flexible rubber insulated cable for products subjected to medium mechanical stresses in dry and damp places. Use as supply leads for transportable motors, appliances, hand-held lamps, electric tools and machines on building sites, in agricultural use, workshops, and utility water equipment. Permissible for installation on plaster and direct installation on structural parts of hoists and other heavy machines.

Harmonized Wire Coding System

This chart illustrates the Harmonization code for cordage "H05VVF3G0.75" —



*Uo/U where Uo is the rated RMS operating voltage between any insulated conductor and ground. U is the rated RMS operating voltage between any two conductors.

North American Cordage

National Electric Code guides for use of Flexible Cords and Cables includes PVC and Rubber Types (excerpt from Article 400)

Use on "pendants" (hanging fixtures such as lights), connection of portable lamps or appliances; wiring of cranes and hoists; connection of stationary equipment to facilitate frequent interchange. (This cordage may **not** be used as a substitute for fixed wiring of a structure where it is run through walls, ceilings or attached to building surfaces.)

PVC jacketed cordage:

SJT: Trade Name: "Junior Hard Service." Outer covering is thermoplastic; insulation is thermoplastic or thermoset. For pendant or portable use, damp locations, for hard usage.

SVT: Trade Name: "Vacuum Cleaner Cord." Outer covering is thermoplastic; insulation is thermoset or thermoplastic. For pendant or portable use, damp locations, not for hard usage.

Rubber jacketed cordage:

SO: Trade Name: "Hard Service Cord." Outer covering is oil resistant thermoset; insulation is thermoset. For pendant or portable use, damp locations, for extra hard usage. Permitted for use on theater stages, in garages, etc.

SEO: Trade Name: "Hard Service Cord." Outer covering is thermoplastic elastomer; insulation is thermoplastic elastomer. For pendant or portable use, damp locations, for extra hard usage.

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IP Codes (Ingress Protection)

IEC 60529 outlines an international classification system for the sealing effectiveness of enclosures of electrical equipment against the intrusion into the equipment of foreign bodies (i.e., tools, dust, fingers) and moisture. This classification system utilizes the letters "IP" ("Ingress Protection") followed by two digits. (An "X" is used for one of the digits if there is only one class of protection; i.e., IP X4 which addresses moisture resistance only.)

Degrees of Protection - First Digit
The first digit of the IP code indicates the degree that persons are protected against contact with moving parts (other than smooth rotating shafts, etc.) and the degree that equipment is protected against solid foreign bodies intruding into an enclosure.

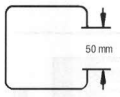
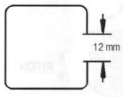
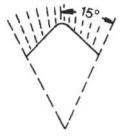
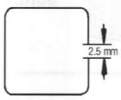
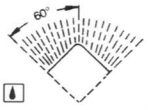
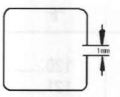
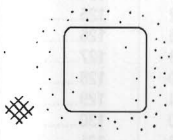
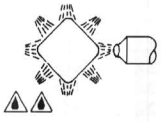
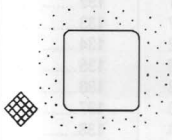
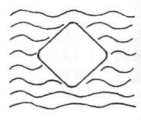
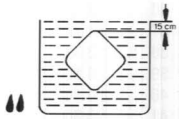
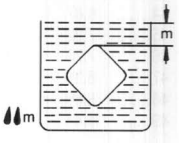
0 No special protection
1 Protection from a large part of the body such as a hand (but no protection from deliberate access); from solid objects greater than 50mm in diameter
2 Protection against fingers or other objects not greater than 80mm in length and 12mm in diameter
3 Protection from entry by tools, wires, etc., with a diameter or thickness greater than 2.5mm
4 Protection from entry by solid objects with a diameter or thickness greater than 1.0mm
5 Protection from the amount of dust that would interfere with the operation of the equipment
6 Dust-tight

Degrees of Protection - Second Digit
Second digit indicates the degree of protection of the equipment inside the enclosure against the harmful entry of various forms of moisture (e.g. dripping, spraying, submersion, etc.).

0 No special protection
1 Protection from dripping water
2 Protection from vertically dripping water
3 Protection from sprayed water
4 Protection from splashed water
5 Protection from water projected from a nozzle
6 Protection against heavy seas, or powerful jets of water
7 Protection against immersion
8 Protection against complete, continuous submersion in water

The IP Code Symbols:
The chart at right illustrates the use of special symbols in the IP classification system. In the "1st digit" columns, note the grid-like symbols next to numbers 5 and 6. In the "2nd digit" columns numbers 3-8 are symbolized by teardrop shaped symbols, sometimes enclosed in a box or a triangle, sometimes unenclosed (7-8). These symbols can be placed on equipment to illustrate the IP protection provided.

IP 54 = **IP** **5** **4**
IP letter code
1st digit
2nd digit

1st digit	Protection from solid objects	2nd digit	Protection from moisture
0	Non protected	0	Non protected
1	 Protected against solid objects greater than 50mm	1	Protected against dripping water
2	 Protected against solid objects greater than 12mm	2	 Protected against dripping water when tilted up to 15°
3	 Protected against solid objects greater than 2.5mm	3	 Protected against spraying water
4	 Protected against solid objects greater than 1.0mm	4	Protected against splashing water
5	 Dust protected	5	 Protected against water jets
6	 Dust tight	6	 Protected against heavy seas
		7	 Protected against the effects of immersion
		8	 Protected against submersion

Note: IEC 60529 does not specify sealing effectiveness against the following: mechanical damage of the equipment; the risk of explosions; certain types of moisture conditions, e.g., those that are produced by condensation; corrosive vapors; fungus; vermin.

Metric Conversion Guides

Conversion Factors

Metric units are used for most linear, weight, and temperature measurements as well as for theread descriptions.

Length
Inch x 25.40 = Millimeters
Millimeters x 0.03937 = Inches
Feet x 0.3048 = Meters
Meters x 3.281 = Feet
Miles x 1.609 = Kilometers
Kilometers x 0.6214 = Miles
Ohms/Kilometer x 0.3048 = Ohms/1000 ft.
Ohms/1000 ft. x 3.2808 = Ohms/Kilometer

Area
Sq. Inch x 6.452 = Sq. Centimeter
Sq. Centimeter x 0.1550 = Sq. Inch
Sq. Foot x 0.0929 = Sq. Meter
Sq. Meter x 10.76 = Sq. Foot
Sq. Mile x 2.590 = Sq. Kilometer
Sq. Kilometer x 0.3861 = Sq. Mile
Circular Mil x 1,000,000 = Circular In.
Circular Mil x 0.7854 = Sq. Mil

Volume
Cu. Inch x 16.39 = Cu. Centimeter
Cu. Centimeter x 0.06102 = Cu. In.
Cu. Foot x 0.02832 = Cu. Meter
Cu. Meter x 35.31 = Cu. Foot

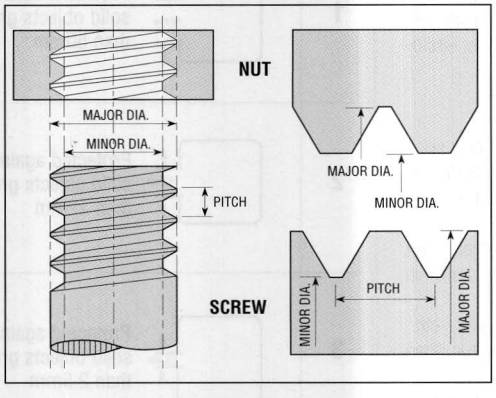
Mass
Ounce x 28.35 = Gram
Gram x 0.03527 = Ounce
Pound x 0.4536 = Kilogram
Kilogram x 2.205 = Ounce

Metric Threads

Most threaded components and components with mounting holes (such as AC power inlets) listed in this catalog are referred to in terms of their metric dimensions. For example, an M3 mounting hole indicates that the hole is sized for an M3 mounting screw. The metric screw will be referred to in the following format:

M3 X 0.50

As these drawings illustrate, M3 refers to a major diameter of 3mm. The pitch or distance between threads is 0.50 mm.



Metric Prefixes

Tera	10^{12}	T
Giga	10^{9}	G
Mega	10^{6}	M
Kilo	10^{3}	k
Hecto	10^{2}	h
Deca	10^{1}	da
Deci	10^{-1}	d
Centi	10^{-2}	c
Milli	10^{-3}	m
Micro	10^{-6}	μ
Nano	10^{-9}	n
Pico	10^{-12}	p

A.W.G. to Metric Wire Sizes Conversion Chart

AWG	Equivalent in mm²
20 (7X28)*	0.562
18 (7X26)	0.902
16 (19X29)	1.327
14 (19X27)	1.954
12 (19X25)	3.105
10 (37X26)	4.770
8 (49X25)	8.007
6 (133X27)	13.675
4 (133X25)	21.733
2 (133X23)	34.648
1 (817X30)	41.667
0 (133X21)	55.098

*Number in parenthesis denotes stranding. Actual stranding may vary depending on primary conductor construction. Cross section in mm² will vary when stranding changes.

Temperature Conversion (Fahrenheit to Celsius)

°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C	°F	°C
- 40	- 40.00	15	- 9.44	50	10.00	85	29.44	120	48.89	155	68.33	190	87.78	325	162.78
- 38	- 38.89	16	- 8.89	51	10.56	86	30.00	121	49.44	156	68.88	191	88.33	330	165.56
- 36	- 37.78	17	- 8.33	52	11.11	87	30.56	122	50.00	157	69.44	192	88.88	335	168.33
- 34	- 36.67	18	- 7.78	53	11.67	88	31.11	123	50.55	158	70.00	193	89.44	340	171.11
- 32	- 35.56	19	- 7.22	54	12.22	89	31.67	124	51.11	159	70.55	194	90.00	345	173.89
- 30	- 34.44	20	- 6.67	55	12.78	90	32.22	125	51.67	160	71.11	195	90.55	350	176.67
- 28	- 33.33	21	- 6.11	56	13.33	91	32.78	126	52.22	161	71.66	196	91.11	355	179.44
- 26	- 32.22	22	- 5.56	57	13.89	92	33.33	127	52.77	162	72.22	197	91.66	360	182.22
- 24	- 31.11	23	- 5.00	58	14.44	93	33.89	128	53.33	163	72.77	198	92.22	365	185.00
- 22	- 30.00	24	- 4.44	59	15.00	94	34.44	129	53.88	164	73.33	199	92.77	370	187.78
- 20	- 28.89	25	- 3.89	60	15.56	95	35.00	130	54.44	165	73.89	200	93.33	375	190.55
- 18	- 27.78	26	- 3.33	61	16.11	96	35.56	131	55.00	166	74.44	205	96.11	380	193.33
- 16	- 26.67	27	- 2.78	62	16.67	97	36.11	132	55.55	167	75.00	210	98.89	385	196.11
- 14	- 25.56	28	- 2.22	63	17.22	98	36.67	133	56.11	168	75.55	215	101.67	390	198.89
- 12	- 24.44	29	- 1.67	64	17.78	99	37.22	134	56.66	169	76.11	220	104.44	395	201.67
- 10	- 23.33	30	- 1.11	65	18.33	100	37.78	135	57.22	170	76.67	225	107.22	400	204.44
- 8	- 22.22	31	- 0.56	66	18.89	101	38.33	136	57.77	171	77.22	230	110.00	405	207.22
- 6	- 21.11	32	0.00	67	19.44	102	38.88	137	58.33	172	77.77	235	112.78	410	210.00
- 4	- 20.00	33	0.56	68	20.00	103	39.44	138	58.88	173	78.33	240	115.56	415	212.78
- 2	- 18.89	34	1.11	69	20.56	104	40.00	139	59.44	174	78.88	245	118.33	420	215.56
0	- 17.78	35	1.67	70	21.11	105	40.55	140	60.00	175	79.44	250	121.11	425	218.33
1	- 17.22	36	2.22	71	21.67	106	41.11	141	60.55	176	80.00	255	123.89	430	221.11
2	- 16.67	37	2.78	72	22.22	107	41.66	142	61.11	177	80.55	260	126.67	435	223.89
3	- 16.11	38	3.33	73	22.78	108	42.22	143	61.66	178	81.11	265	129.44	440	226.67
4	- 15.56	39	3.89	74	23.33	109	42.77	144	62.22	179	81.66	270	132.22	445	229.44
5	- 15.00	40	4.44	75	23.89	110	43.33	145	62.78	180	82.22	275	135.00	450	232.22
6	- 14.44	41	5.00	76	24.44	111	43.88	146	63.33	181	82.77	280	137.78	455	235.00
7	- 13.89	42	5.56	77	25.00	112	44.44	147	63.88	182	83.33	285	140.55	460	237.78
8	- 13.33	43	6.11	78	25.56	113	45.00	148	64.44	183	83.88	290	143.33	465	240.55
9	- 12.78	44	6.67	79	26.11	114	45.55	149	65.00	184	84.44	295	146.11	470	243.33
10	- 12.22	45	7.22	80	26.67	115	46.11	150	65.56	185	85.00	300	148.89	475	246.11
11	- 11.67	46	7.78	81	27.72	116	46.66	151	66.11	186	85.55	305	151.67	480	248.89
12	- 11.11	47	8.33	82	27.78	117	47.22	152	66.66	187	86.11	310	154.44	485	251.67
13	- 10.56	48	8.89	83	28.33	118	47.77	153	67.22	188	86.66	315	157.22	490	254.44
14	- 10.00	49	9.44	84	28.89	119	48.33	154	67.77	189	87.22	320	160.00	495	257.22

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Glossary & Index

¼ x 1¼ inch fuse
13; power modules, 170; fuse & fuseholders, 205-209
The standard North American fuse used in instrument applications; officially recognized by ANSI as the 3AG fuse. It is used primarily in North America.

5 x 20mm fuse
13; power modules, 170; fuses & fuseholders, 205-209
The standard international fuse for use in instrumentation applications. It is described in IEC publication 60127 and is the most commonly used instrumentation fuse throughout the world except in the United States and Canada.

Afsnit 107-2-01
Cords 17, 35; plugs & sockets, 95
The Danish plug and socket standard.

American Electronics Assoc. *256*

ANSI *9, 253, 256*

AS 3112
16, 30; plugs & sockets, 93-94; socket strips, 234
The Australian plug and socket standard.

AS 3191 (SAA 3191) 31

AS 3260 .....*7*

ASTA *61,253*

Accessory Power *13, 19, 87, 195, 229*

Approval *8*
After a complete product or component part is tested by a testing agency, the test results may be represented in the form of an approval. Agencies which grant approvals on components include SEMKO, FIMKO, NEMKO, DEMKO, KEMA, CEBEC, SEV, OVE, and, in some cases, VDE. (See also Certification, Gutachten, Recognition.)

AWG *12,131*
American Wire Gauge

BASEC *61,253*

BASEEFA *253*

BEAB *253*

Breaking capacity *205-209*
The breaking capacity describes the ability of the fuse to interrupt a fault condition without itself being destroyed. See low and high breaking capacity fuses.

Breaking characteristic *205-209*
The conditions under which a fuse will interrupt the flow of current through it; expressed in terms of the time in seconds or minutes required to break the circuit. The current flowing is expressed as a percentage of the rated current in amperes. Breaking characteristics are specified in IEC 127 and UL 198G.

BSI 7, 61, 253, 256

BS 546
16, 38; plugs & sockets, 96
The old British plug and socket standard, still found in India and other areas electrified by the British.

BS 1362 .....*61*

BS 1363
16, 61; plug box, 114; plugs & sockets, 113-114; socket strips, 237
British plug and socket standard

BS 6500 .....*61*

British Ring Wiring System *16*

C22.2, No. 42 .....*18*
Canadian plug and socket system

C22.2, No. 49 .....*131*

C22.2, No. 59 .....*207*

C22.2, No. 950 .....*7*

CB Scheme *7, 258*

CE *6,11*

CEBEC *8, 245*

CEE *14*

CEE 7/4 and 7/7 .....
15-17; cords, 23, 35; snap-cover sockets, 91; plug boxes, 92; plugs & sockets, 90-91; socket strips, 232-233, 234; 259
The German plug and socket system used in most of Europe.

CEE 7-16 .....*16, 27*
Class 1"Europlug" 2.5A plug.

CEI 23-16/VII
Cords, 18 & 44; plugs & sockets, 97
The Italian plug and socket system.

CEN *7, 9, 256*

CENELEC .....*7; cordage, 131; 256*

CENELEC 14 .....*12*

Certification
Certification is another of the terms used to describe the results of testing by one of the national agencies. CSA certifies products once tested and found to be satisfactory and consistent with CSA standards.

Chinese Plug/Socket 18, *34*

Class 0 equipment
Class 0 equipment are appliances having parts with functional insulation only and without any provision for grounding.

Class I equipment *12, 15, 169*
Class I equipment has parts with functional insulation only and with provision for grounding. Class I equipment contains a carefully grounded conductive case which is the first line of protection against a hazardous shock. Class I equipment always uses a 3-wire, grounded power supply cord or cordset.

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Class II equipment 16, 19, 27
Class II equipment is provided with double insulation and or reinforced insulation throughout, and therefore has no provision for grounding. Class II equipment protects the user from accidental shock through the use of two independent insulation systems. These appliances are sometimes referred to as being double insulated. A 2-wire ungrounded power cord is used in Class II equipment.

Class III equipment
Class III appliances are designed for connection to extra low voltage circuits.

Clearance *165*
Clearance is the shortest distance between two conductive surfaces.

Common Market
See EC

Contact protection
See "Touchproof"

Continental European
For purposes of this catalog, "Continental European" refers to cords, plugs and sockets using the CEE 7/7 or Schuko plug/socket standard. The countries included are: Germany, France (plug only), Belgium (plug only), Austria, the Netherlands, Norway, Sweden, and Finland.

Cordset *13, 15, 20-22*
A cordset is a detachable means for supplying electrical energy from the mains supply to an electrical device. It has a connector on each end. The standard primary power connector that would be used at the interface between the cordset and the electrical device is the IEC 60320 connector.

Creepage.....*165*
Creepage is the shortest distance between two conducting parts measured along the surface of the insulating material between them.

CSA *13, 49, 205, 245, 257*

Data Circuits.....*17*

DEMKO 8, *246, 257*

Dentori *46, 249*

DIN *19, 257*

EC/EEC *5, 9*

EFTA *5*

EN documents *7*

EN 60 950 .....*7, 13*

Europlug *16, 27*

FIMKO 246

French/Belgian socket
15; snap cover socket, 95; socket strip, 234. For plugs, see CEE 7/7.
The French/Belgian socket has a male grounding pin but accepts the standard German CEE 7/7 plug.

Fuses
See ¼ x 1¼ inch or 5x20mm fuse above

Fuseholder
13; power modules, 170-171; fuses & fuseholders, 205-209
A fuseholder is a totally enclosed device into which a fuse can be installed so that the equipment user is protected from accidental electrical contact while allowing easy access to the fuse.

Fusing fatigue factor *205-209*
This is a representation of the result of constant heating and cooling of the fuse element during normal usage as the equipment is turned on and off.

Gost 7396.....*19, 58*
The Russian plug and socket standard

Gutachten.....*195*
A test report or expert opinion issued by VDE covering components or devices which are not otherwise described by VDE or DIN standards. A component which has earned a Gutachten will not normally be allowed to carry the VDE test mark.

Gutachten mit Fertigungsueberwachung
Roughly translated, a favorable test report with factory follow-up issued after the successful test of electronic components in particular which are not expressly covered by VDE or DIN standards. In this case, the product may carry the familiar VDE triangle with the factory follow-up number inserted in the middle.

HAR
See Harmonized Cordage

Harmonized Cordage *13, 131-132, 262*
"HAR" cordage meets the requirements or Harmonized Documents HD-21 or HD-22 and will carry one safety agency approval which is recognized by other European safety agencies.

HD 21 .....*7, 23, 131-132, 262*

HD 22 .....*7, 131-132, 262*

HD 472S1 .....*12*

High breaking capacity fuse *205-209*
A high breaking capacity fuse is designed to withstand high fault condition currents without being destroyed. The fuse envelope may be constructed either or glass or a ceramic material, and is always filled with sand or some other agent designed to quench the arc that will form during the fault condition. A high breaking capacity IEC 60127 fuse has a maximum breaking capacity of 1500 amps.

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IEC *7, 258*

IECEE *7, 258*

IEC 60127 .....*205-209*

IEC 60309 .....13, *117-119*
Defines a family of high power connectors

IEC 60320.....
13, 15, 19, 23 cords,67-69; connector locks, 70; accessory power, 195; Accessory power strip, 229 & 238
"Universal" power entry connector available in several configurations and ratings up to 16A international, 20A North American.

IEC 60335.....*147, 165*

IEC 60380.....*13*

IEC 60529.....*118, 263*

IEC 60950.....*170*
(see also EN 60 950)

IMQ *248*

IP .....
118, 263
An IP rating indicates the degree of protection provided by the enclosures of electrical equipment according to IEC publication 60529. The types of protection covered by this system of classification are: a) protection of persons against contact with or approach to live parts and against contact with moving parts inside the enclosure and protection of the equipment against entrance by foreign bodies; and b) protection of the equipment inside the enclosure against harmful intrusion of water.

ISO *7, 259*
ISO 9000 .....*7, 9*

JIS.....*249*

JIS 8303 .....*18, 46*
The Japanese plug and socket standard.

KEMA *8, 250*

LGA *247*

LCIE (UTE) *246*

Low breaking capacity fuses 205-209
Low breaking capacity fuses will break at 35 amps or 10 times their rated current during fault conditions without explosion. They are normally constructed with a glass tube and are not filled with sand (see high breaking capacity fuses).

Medical Products *14, 171*

MITI *18, 46, 248*

NEMA.....*253*

NEMA 5-15
18, cords, 49-57; 98;plug box, 110; medical 108-109; accessory power, 195; PC adapter cord, 197; voltage changer, 225; socket strips 235-236
The main plug and socket standard used in the United States and Canada.

NEMA 5-20.....*102, 169*

NEMA 6-15.....*57, 100, 236*

NEMA 6-20.....*104*

NEMA L5-15 .....*99*

NEMA L5-20.....*103, 169*

NEMA L5-30 .....*106*

NEMA L6-15 .....*101*

NEMA L6-20 .....*105*

NEMA L6-30 .....*107*

NEMKO *8, 250*

OSHA *6*
The U.S. Occupational Safety and Health Administration was organized to reduce workplace safety hazards. Its equivalent in Germany is TUV.

ÖVE *244*

Polarization of European Plugs & Sockets
16; switches, 170

Power supply cord
A power supply cord is a means of transmitting energy from the mains supply to an electrical device through a flexible electrical cable. A cord is permanently installed in the device being powered, as opposed to a cordset, which is detachable.

Primary power components *8*
Primary power components are those discrete devices such as fuses, fuseholders, voltage selectors, transformers, RFI power line filters, inductors, capacitors, indicators, switches, circuit breakers, primary power connectors, cords and cordsets which are located electrically on the power mains side of the transformer. They normally must handle mains voltages.

Product Liability *6*

Quick disconnects
Quick disconnects are blade-type connectors which mate with a simple, formed sheet metal part. Most electrical components are manufactured with the male half of the quick disconnect. The female half is normally mounted on the connecting lead. The most common quick-disconnect sizes are as follows:
.110 x .032 inches — 2.8 x 0.8mm
.187 x .032 inches — 4.8 x 0.8mm
.250 x .032 inches — 6.2 x 0.8mm

Recognition
When it tests an electrical component, UL normally issues a component **recognition** that attests to the fact that it found the component satisfactory for use in certain applications. UL also **lists** complete

products (such as complete cordsets) and certain other components.

RFI
6; 13, shielded cords, 20; 170
Radio frequency interference is a phenomenon that is generated in nature and in electrical equipment as a result of switch closures, and by motors, inductors, and various other complex electrical circuits. RFI is conducted from the point of origination either through the cables or by radiation through the air. In either case, it may present performance problems for adjacent equipment.

SA *244, 260*

SNZ *30, 260*

Schuko
See "Continental European"

SEMKO
8, 13; Fuses & Fuseholders, 205; 252, 260

SEV *8, 59, 252*

SEV 1011
18; cords, 59, snap-cover socket, 112; plugs & sockets, 112
The Swiss plug and socket standard.

SI 32 .....*17, 41, 96*
The Israeli plug and socket standard.

SII *248*

THE—Technical Help to Exporters *256, 260*

Touchproof *206*

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TUV 247

UL
8, 13; *fuses & fuseholders, 205-207; 254, 260-261*

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UL 1950 .....*7*

"Universal Product" *12-14*

VDE .....
8, 13; Fuses & Fuseholders, 205; 247, 261

VDE 0806/IEC 60380 .....*13*

VDE 0805/EN 60 950 .....*13*

Voltage selector *13, 170, 201*
A voltage selector is electrically a switch that allows the primary circuit of an electrical device to be switched so that it can accommodate different mains supply voltages that are common in various parts of the world. It is normally mechanically designed so that it will not be accidentally changed without the use of a tool.

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Ordering Information — Policies and Procedures

Panel Components' North American stock is centralized at our headquarters in Oskaloosa, Iowa. We maintain a substantial inventory which enables us to be responsive to our clients' needs. Orders for items in stock are normally shipped within 48 hours. Back-ordered and special items are normally shipped within 8 weeks; however, this can vary depending on the products. All orders must be made out to Panel Components Corporation. They may be placed by mail, FAX, or telephone with our Oskaloosa office or with the office of our regional sales representative who has responsibility for your area. Confirming purchase orders should be sent to support orders placed by telephone.

Rush orders: When requested, Panel Components Corporation can ship orders on the same day if the order is placed by 5:00 p.m. Central time. Orders placed after 5:00 p.m. for same-day shipment are subject to a $30 handling charge.

Scheduled orders: Orders may be placed with up to 12 shipments to be scheduled within 12 months of date of initial order. However, orders with delivery dates more than 30 days after receipt of the order in Oskaloosa are subject to price adjustments if the exchange rate against the applicable foreign currency rises more than 5% above the base rate at which the original price was quoted.

Special orders: Merchandise that is special ordered or is not a standard item may not be returned, and orders for such items are not subject to cancellation.

Open accounts:

U.S. & Canadian Customers: Firms may apply for an open account by furnishing us with one bank and three trade references. All orders are shipped on a C.O.D. basis until credit is approved.

Export Customers: We are willing to extend open account terms to export customers who can provide one U.S. bank and three U.S. trade references. Other credit references may be considered at our option.

Export orders: Panel Components Corporation welcomes export orders. Please note that terms on export orders are for payment in U.S. dollars. We will accept an international draft, bank wire transfer, or irrevocable letter of credit as payment. Canadian orders are processed as domestic orders with no additional charges applicable. Payment of Canadian orders may be made with corporate checks or drafts; however, they must be denominated in U.S. dollars.

Terms of payment: Our terms of payment on open accounts are 1% 10 days, net 30 from the date of invoice. Shipments of future orders will be affected by the past due condition of an account.

Visa/MasterCard: Payment may be made by VISA or MasterCard.

Minimum orders: We do not have a minimum order (except for fuses which are sold in packages of ten pieces).

Taxes: Sales tax will be added to all orders shipped to a California or Iowa address unless a valid tax exemption certificate has been filed with our office. Any applicable federal, state, or local taxes will also be added.

C.O.D. orders: We reserve the right to require that payment be made in cash, by postal money order, or with a certified check. C.O.D. charges will be added to the invoice.

Cash orders and advance payments: Please include all shipping charges, insurance charges and applicable sales taxes in your payment. We reserve the right to delay shipment on orders accompanied by personal checks until the checks have cleared.

Special packaging: When requested at the time of order entry, we can package materials in non-standard configurations. An additional service charge will be assessed for materials and labor in these cases.

Prices: All quoted prices are net and F.O.B. Oskaloosa, Iowa.

Return Material Authorization: Our receiving department has been instructed to accept packages from customers only when our RMA number is clearly visible on the shipping label. Please contact our Customer Service Department to request an RMA number.

Restocking charges: A restocking charge of up to 15% of the value of the returned goods may be assessed when they are taken back for the convenience of the client.

Refused shipments: When goods are returned to us because they were not accepted and when we are subsequently requested to reship them, the new invoice will include the cost of both outbound shipments plus the inbound shipment.

Catalog specifications: All specifications listed in our catalog or on other data sheets are based on our knowledge and understanding of the products as of the time of printing of the literature. We reserve the right to make changes to technical specifications without notice. All product recommendations are based on our knowledge and experience with the products, but do not eliminate customer responsibility to check the suitability of our products for each particular application. We are happy to provide free samples for this evaluation.

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88031070	106
88031080	105
88031100	98
88031110	100
88031120	102
88031130	104
88031140	99
88031150	101
88031160	106
88031170	106
88031180	107
88031210	99
88031220	99
88040011	113
88040030	92
88040040	92
88050010	113
88050020	113
88090010	90
88090040	111
88090050	111
88100011	97

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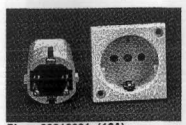
Guide to Worldwide Plug/Socket Patterns & Power Mains (single phase)

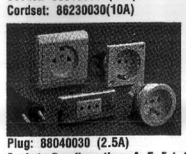
The most frequently specified plug pattern for electrical or electronic equipment will appear in bold type. Note that the information provided for developing countries is not precise. The data given for single phase voltages are nominal and are subject to a standard tolerance of 10%, but in some areas—particularly in developing countries—tolerances may be much greater. Variations from the nominal frequencies as listed may be considerably greater in developing countries than in the industrialized world.

The information here was compiled from several sources, including: "Electric Current Abroad," (now out of print). Information current as of the time of publication. Subject to change without notification. Call our Customer Service Department for current information.



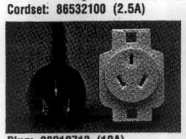
Plug: 88010801 (16A)
Socket: 88010610 (16A)
Cordset: 86230030(10A)

Cont. Europe (Schuko) CEE 7



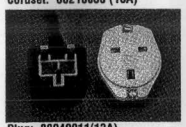
Plug: 88040030 (2.5A)
Socket: See figurations A, E, F, I, O, L.
Cordset: 86532100 (2.5A)

Europlug CEE 7/16



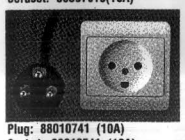
Plug: 88010713 (10A)
Socket: 88010512 (10A)
Cordset: 86210030 (10A)

Australia/ New Zeland



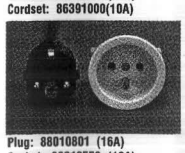
Plug: 88040011(13A)
Socket: 88010621 (13A)
Cordset: 86397010(10A)

United Kingdom/ Ireland



Plug: 88010741 (10A)
Socket: 88010541 (10A)
Cordset: 86391000(10A)

Denmark

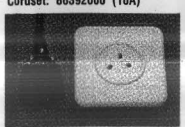


Plug: 88010801 (16A)
Socket: 88010550 (16A)
Cordset: 86230030(10A)

France/ Belgium

Plug: 88010763 (15A)
Socket: 88010561 (15A)
Cordset: 86392000 (10A)

India/South Africa (Old. Brit.)



Plug: 88010780 (16A)
Socket: 88010580 (16A)

Israel

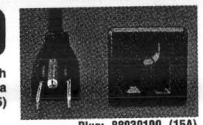
Country	Voltage	Freq./Hz	Pattern
Afghanistan	220	50	G
Algeria	127/220	50	B, **F**
American Samoa	120/240	60	**C**, K, N
Angola	220	50	A,B
Anguilla (U.K.)	240	50	**D**
Antigua	230	60	**D**, K, N
Argentina	220	50	T
Aruba	115/127	60	A, B, K., N
Australia	240	50	**C**, P
Austria	220-230*	50	A, B
Azores (Portugal)	220	50	A, B
Bahamas	120	60	**K**, N
Bahrain	220	50	**D**, G
Bangladesh	220	50	G
Barbados	115	50	**K**, N
Belgium	220-230*	50	B, F
Belize	110	60	**K**, N
Benin	220	50	G
Bermuda	120	60	K, N
Bolivia	110-115/220	50	A, B
Bosnia-Herzegovina	220	50	A, B
Botswana	220	50	**D**, G
Brazil	110-220	60	B, K, N
Bulgaria	220	50	A, B
Burkina Faso	220	50	B
Burma (now Myanmar)	230	50	**D**, G
Burundi	220	50	**A**, B
Cambodia	120/220	50	B
Cameroon	220-230	50	B, F
Canada	120	60	**K**, N
Canary Islands (Spain)	220	50	B, F
Cape Verde, Rep. of	220	50	A, B
Cayman Islands	120	60	K, N
Central African Rep.	220	50	B
Chad	220	50	A, F
Channel Islands	240	50	B, **D**
Chile	220	50	B, I
China, People's Rep. of	220	50	B, X
Christmas Is. (Austral.)	240	50	C
Cocos Is. (Austral.)	240	50	C
Colombia	110-220	60	N
Congo, Rep. of	220	50	B
Cook Is. (N.Z.)	240	50	C
Costa Rica	120	60	**K**, N
Croatia	220	50	O
Cuba	120	60	K, N
Curacao Is.	110/220	60	A, K
Cyprus	240	50	D
Czech, Rep of	220	50	B, F
El Salvador	115	60	**K**, N
England	240	50	**D**, G
Ecuador	120	60	**K**, N
Equatorial Guinea	220	50	B
Estonia	220	50	A, B
Ethiopia	220	50	A, B, I
Fiji	240	50	**C**
Finland	220-230*	50	A, B
France	220-230*	50	B, F
French Guiana	220	50	B, F
Gabon	220	50	B, F
Gambia	220	50	D
Germany	220-230*	50	A, B
Ghana	220	50	B, **D**, G
Gibraltar	240	50	D
Greece	220-230*	50	A, B
Greenland (Den.)	220	50	B, E
Grenada	230	50	**D**, G
Guadeloupe	220	50	B, F
Guam	110-120	60	**K**, N
Guatemala	120	60	**K**, N
Guinea	220	50	B, F
Guinea-Bissau	220	50	A, B
Guyana	110	50-60	**D**, G,
Haiti	110-120	50-60	**K**, N
Honduras	110	60	**K**, N
Hong Kong	200	50	**D**, G
Hungary	220	50	A
Iceland	220	50	**A**, B
India	220-250	50	G
Indonesia	220	50	A, B
Iran	220	50	A, B
Iraq	220	50	**D**, G
Ireland, Rep. of (S.)	220	50	D
Isle of Man	240	50	D
Israel	230	50	B, **H**
Italy	220-230*	50	B, **I**
Ivory Coast	220	50	B
Jamaica	110	50	K, N
Japan	100	50 & 60	J, M
Jordan	220	50	A, B, **D**
Kenya	240	50	**D**, G
Kuwait	240	50	**D**, G
Laos	220	50	B, K, N
Latvia	220	50	A, B
Lebanon	110-220	50	B, D, G
Macao	220	50	B, **G**
Madagascar	220	50	B, F
Madeira (Portugal)	220	50	B, **G**
Majorca	220	50	A, B
Malawi	230	50	D
Malaysia	240	50	D
Maldives	230	50	G
Mali, Rep. of	220	50	B, F
Malta	240	50	D
Martinique	220	50	B, F
Mauritania	220	50	B
Mauritius	230	50	**D**, G
Mexico	127	60	**K**, N
Moldova	220	50	O
Monaco	220	50	A, **B**, **F**
Mongolia	220	50	B
Montseurrat	230	60	**D**, K, N
Mozambique	220	50	A, B
Morocco	220	50	A, B, F
Namibia (W.S.Africa)	220-250	50	G
Nepal	220	50	G
Netherlands	220-230*	50	A, B
Neth. Antilles	120-127/220	50/60	A, B, K
New Caledonia	220	50	B, F
New Zealand	230	50	C
Nicaragua	120	60	K, N
Niger	220	50	B
Nigeria	230	50	**D**, G
Norfolk Is. (Australia)	240	50	C
No. Mariana Is. (U.S.)	115	60	K, N
No. Ireland	220	50	D
Norway	220-230*	50	A, B
Okinawa	100-120	60	N
Oman	240	50	D, G
Pakistan	230	50	G
Panama	110-120	60	K, N
Papua New Guinea	240	50	C, P
Paraguay	220	50	B
Peru	110/220	50/60	B
Philippines	115	60	K, N
Pitcairn Is. (U.K.)	240	50	G
Poland	220	50	A, B, F
Portugal	220-230*	50	**A**, B, G
Puerto Rico	120	60	**K**, N
Qatar	240	50	D, G
Romania	220	50	A, B
Russia	220	50	O
Sierra Leone	230	50	D, G
Singapore	230	50	D, G
Slovakia	220	50	B, F
Slovenia	220	50	O
Somalia	110/220	50	B, F
South Africa	220-250	50	G
South Korea	220	60	A, **K**, N
Spain	220-230*	50	B, F
Sri Lanka	230	50	G
St. Pierre & Miquelon (Fr.)	115	60	K, N
St. Kitts & Nevis	230	60	**D**, G
St. Lucia	240	50	D
St. Vincent	230	50	D
Sudan	240	50	B
Surinam	115	60	A, B
Svalbard (Norway)	220	50	A, B
Swaziland	230	50	G
Sweden	220-230*	50	A, B
Switzerland	220-230*	50	L
Syria	220	50	B
Tahiti	220	50	F
Taiwan	110	60	**K**, N
Tanzania	230	50	**D**, G
Thailand	220/230	50	**B**, K, N
Togo	220	50	B, F
Tonga	115	60	C, **G**
Trinidad & Tobago	115/230	60	**D**, G, K,
Tunisia	220	50	B
Turkey	220	50	A, B
Uganda	240	50	G
United Arab Emir.	220/230	50	**D**, G
United Kingdom & Ire.	240	50	**D**, G
United States	120	60	K
Ukraine	220	50	O
Uruguay	220	50	C**
Venezuela	120	60	K, N
Vietnam	120/220	50	**B**, F, K, N
Virgin Islands	120	60	**K**, N
Wales	220	50	D
Western Samoa	230	50	C
Yemen	220	50	B, **D**, **G**
Yugoslavia	220	50	A, B
Zaire, Rep. of	220	50	F
Zambia	220	50	D
Zimbabwe	220	50	**D**, G

Plug Pattern Type

Japan

Plug: Not Available
Socket: 88010641 (15A)
Cordset: 86589000 (7A)

North America (Nema 5-15)

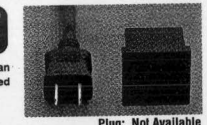


Plug: 88030100 (15A)
Socket: 88010641 (15A)
Cordset: 70401020244 (10A)

Switzerland

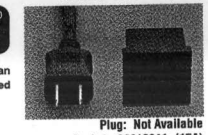
Plug: 88010732 (10A)
Socket: 88010530 (10A)
Cordset: 86396000 (10A)

Japan Ungrounded



Plug: Not Available
Socket: 88010641 (15A)
Cordset: 86532140 (2.5A)

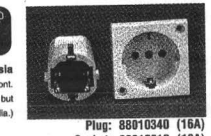
North American Ungrounded



Plug: Not Available
Socket: 88010641 (15A)
Cordset: 86560010 (10A)

Russia

(Note: Similar to the Cont. Europe configuration, but pins are only 4 mm in dia.)



Plug: 88010340 (16A)
Socket: 88010610 (16A)
Cordset: 86513060 (10A)

Australia Ungrounded

Plug: Not Available
Socket: 88010512 (15A)
Cordset: 86532110 (2.5A)

China

Plug: Not Available

Plug: 88010780 (16A)
Socket: 88010580 (16A)
Cordset: 86393000 (10A)

Plug: 88010771 (10A)
Socket: 88010572 (10A)
Cordset: 86394000 (10A)

Italy

Cyprus	240	50	D	Laos	220	50	B, K, N				Zambia	220	50	D
Czech, Rep of	220	50	B, F	Latvia	220	50	A, B	Romania	220	50	A, B	Zimbabwe	220	50	D, G
				Lebanon	110-220	50	B, D, G	Russia	220	50	O				
Denmark	220-230*	50	B, E	Lesotho	240	50	G	Rwanda	220	50	B				
Djibouti, Rep. of	220	50	B, F	Liberia	120	60	N								
Dominica	230	50	D	Libya	127-230	50	G, I	Saudi Arabia	127/220	50/60	A, F, K,				
Dominican Rep.	110	60	K, N	Liechtenstein	220	50	L	Scotland	220	50	D				
				Lithuania	220	50	A, B	Senegal	220	50	F				
Egypt	220	50	B	Luxembourg	220-230*	50	A, B	Seychelles	240	50	D, G				

* Many European countries have changed over from 220VAC to 230VAC power mains system per CENELEC Memo No. 14. Some have yet to complete the transition.

** These countries use the Australia standard with modifications. The contacts are aprox. 1mm longer then the Australian (18.2mm).

China

Plug: Not Available
Socket: 88010512 (10A)
Cordset: 86517040 (10A)

Argentina

Plug: Not Available
Socket: 88010512 (10A)
Cordset: 86390010 (10A)

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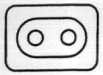
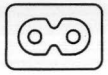
*As of 1997, the International Electrotechnical Commission changed their numbering system. For example the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.



Class II Cold, 70°C
0.2A/250V
Inlet: C2
Not Available
Connector: C1
Not Available
Module:
Not Available
Cordset:
Not Available

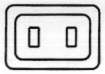
Class I Cold, 70°C
2.5A/250V
Inlet: C6
83011520
Connector: C5
Not Available
Module: C6
83016310
Cordset: C5

Australia/N. Z.	**86557120**
Denmark	**86557160**
India/S. Africa	**86557150**
Israel	**86557190**
Italy	**96557180**
Japan	**86557110**
N. America	**86557100**
Schuko	**86557130**
Switzerland	**86557170**
U. K./Ireland	**86557140**



Class II Cold, 70°C
2.5A/250V
Inlet: C8
83011500
83011510
Connector: C7
Not Available
Module: C8
83016220
Cordset: C8

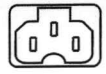
Australia/N. Z.	**86532110**
Europlug	**86532100**
India/S. Africa	**86532130**
Japan	**86532140**
N. America	**86532120**
U. K./Ireland	**86552100**



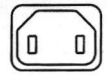
Class II Cold, 70°C
6A/250V
Inlet: C10
Not Available
Connector: C9
Not Available
Module:
Not Available
Cordset:
Not Available

Class I Cold, 70°C
10A/250V (International)
15A/250V (North American)
Inlet: C14
8301211 (10A)
8301212 (10A)
8301213 (15A)
8301311 (10A)
83013111 (10A)
8301312 (10A)
83013121 (15A)
83011172 (10A/15A)
Connector: C13
83011152 (straight)
83011141 (angled)
Module:
Call for modules.
Cordset:
Part numbers for cordsets with C13 connectors are listed under photos above.

Class I Hot, 120°C
10A/250V (International)
15A/250V (North American)
Inlet: C16
8301711
Connector: C15
8943 W 60 (straight)
8943 L W 60 (angled)
83012700 (straight)
83012720 (angled)
Module:
Not Available
Cordset:
Not Available



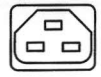
Class I Very Hot, 155°C
10A/250V (International)
15A/250V (North American)
Inlet: C16A
Not Available
Connector: C15A
Not Available
Module:
Not Available
Cordset:
Not Available



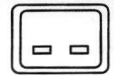
Class II Cold, 70°C
10A/250V (International)
15A/250V (North American)
Inlet: C18
83012330
Connector: C17
Not Available
Module:
Not Available
Cordset:
Not Available

Class I Cold, 70°C
16A/250V (International)
20A/250V (North American)
Inlet: C 20
83011340
Connector: C 19
83011380
Module:
Not Available
Cordset:

Australia/N.Z.	**86210080**
India	**86395000**
Israel	**86395030**
Italy	**86395060**
N. America	**71825110250**
Schuko	**86235000**
U.K./Ireland	**86395090**



Class I Very Hot, 155°C
16A/250V (International)
20A/250V (North American)
Inlet: C22
Not Available
Connector: C 21
Not Available
Module:
Not Available
Cordset:
Not Available



Class I Cold, 70°C
16A/250V (International)
20A/250V (North American)
Inlet: C24
Not Available
Connector: C 23
Not Available
Module:
Not Available
Cordset:
Not Available

IEC 60320-2-2* Style Interconnection Couplers

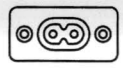
IEC 60320* rates devices labeled "Cold" at 70°C. EN 60320 rates devices labeled "Cold" at 65°C.

*As of 1997, the International Electrotechnical Commission changed their numbering system. For example the designation IEC 60320 is the same as the older designation IEC 320. The change, (achieved by adding 60,000 to their existing numbers) was made to harmonize their system with the EN (European Normalisation) numbering system.

SHEET A
Class I, 70°C
2.5A/250V
Plug connector:
Not Available

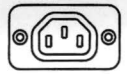
SHEET B
Class I, 70°C
2.5A/250V
Outlet:
Not Available

SHEET C
Class II, 70°C
2.5A/250V
Plug Connector:
Not Available



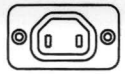
SHEET D
Class II, 70°C
2.5A/250V
Outlet:
Not Available

SHEET E
Class I, 70°C
10A/250V (International)
15A/250V (North America)
Plug Connector:
86557000 (jumper cord)
83011060
83011070



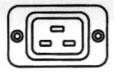
SHEET F
Class I, 70°C
10A/250V (International)
15A/250V (North America)
Outlet:
83011220
83011360
83011370
8301511
8301512
8301611
8301612

SHEET G
Class II, 70°C
10A/250V (International)
15A/250V (North America)
Plug Connector:
Not Available



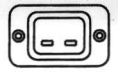
SHEET H
Class II, 70°C
10A/250V (International)
15A/250V (North America)
Outlet:
Not Available

SHEET I
Class I, 70°C
16A/250V (International)
20A/250V (North America)
Plug Connector:
83011390



SHEET J
Class I, 70°C
16A/250V (International)
20A/250V (North America)
Outlet:
83011350

SHEET K
Class II, 70°C
16A/250V (International)
20A/250V (North America)
Plug Connector:
Not Available



SHEET L
Class II, 70°C
16A/250V (International)
20A/250V (North America)
Outlet:
Not Available